

Nov. 7, 1967

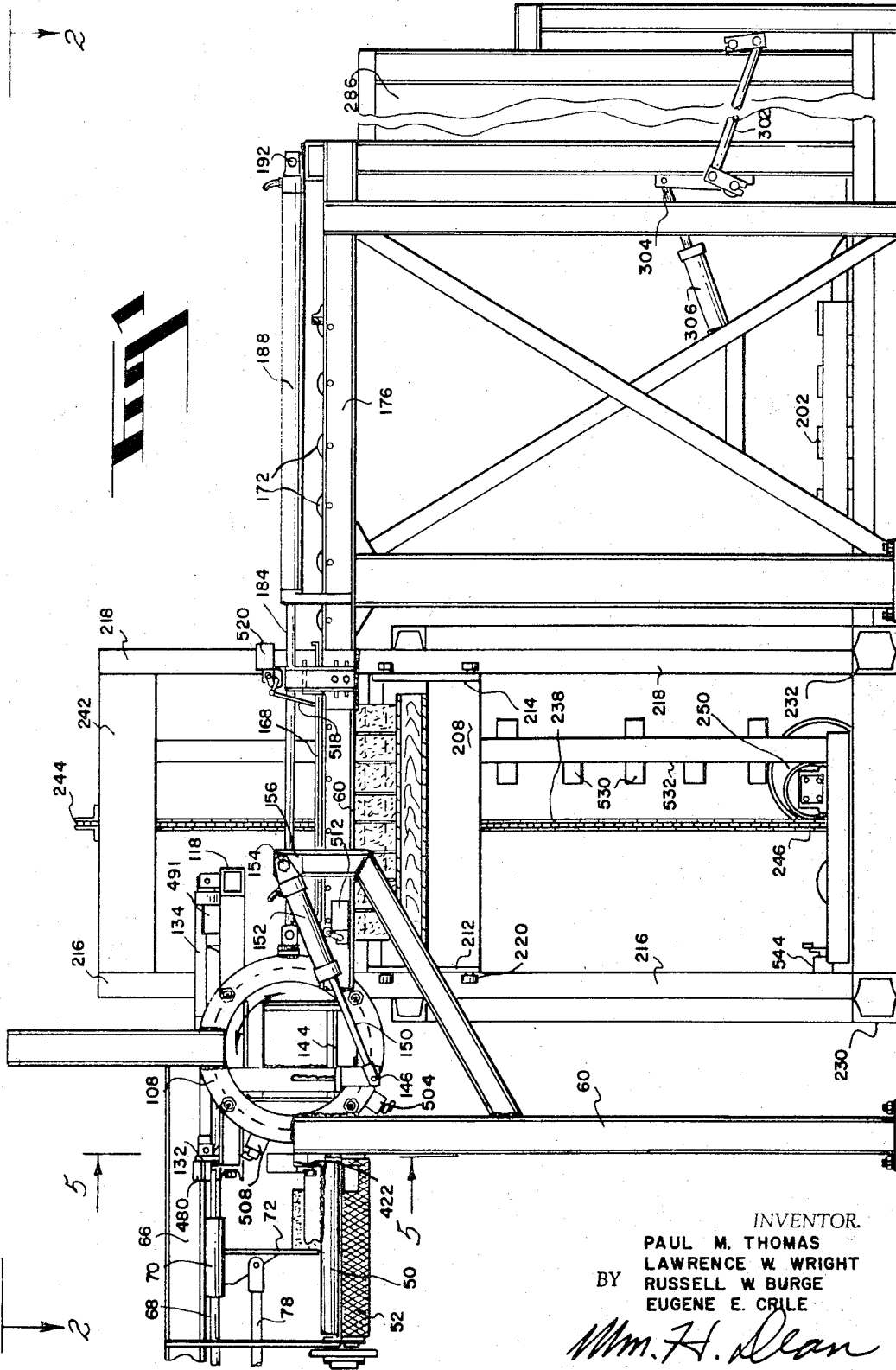
P. M. THOMAS ET AL

3,351,216

CONCRETE BLOCK STACKING MACHINE

Filed Nov. 25, 1964

24 Sheets-Sheet 1



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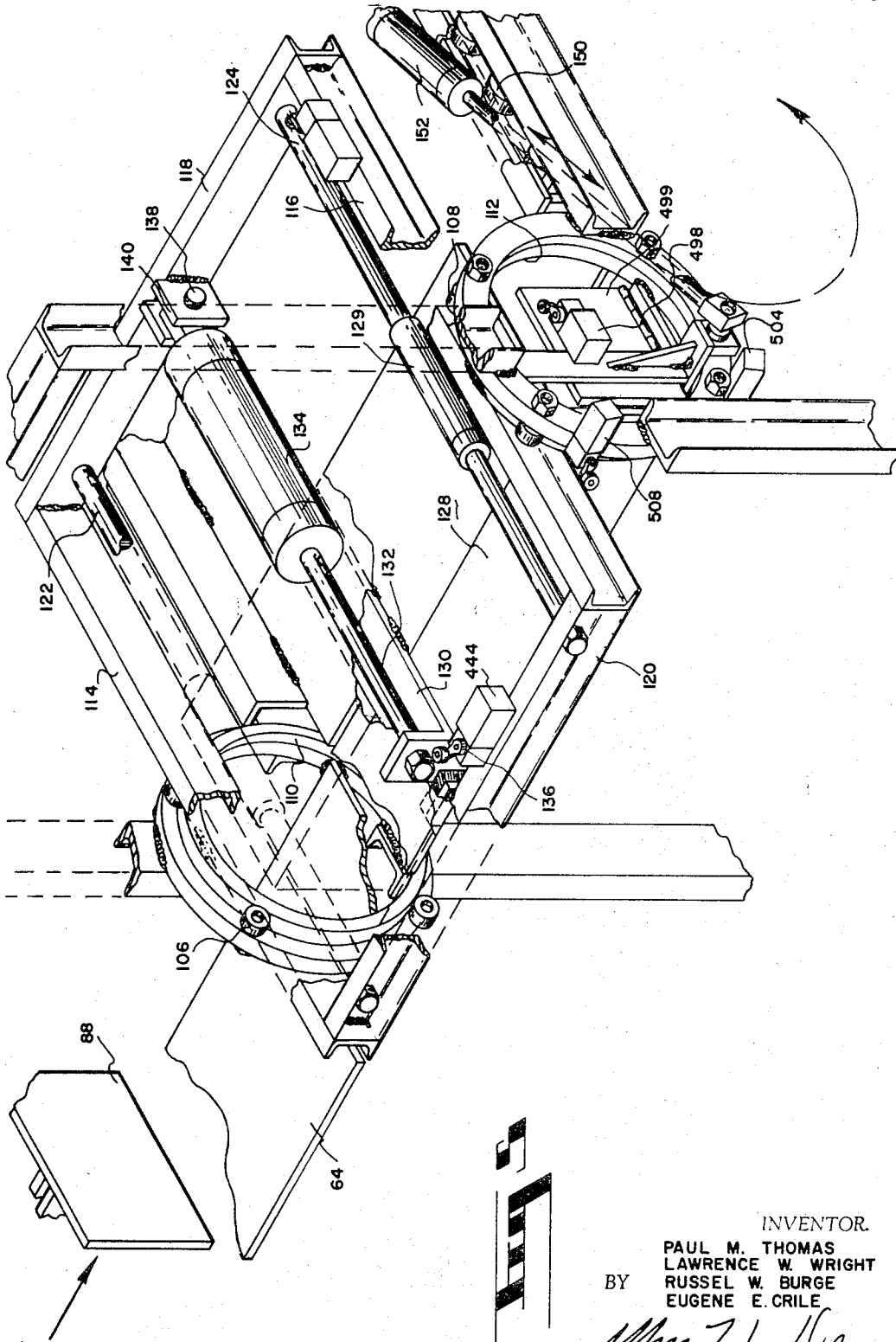
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24 Sheets-Sheet 5



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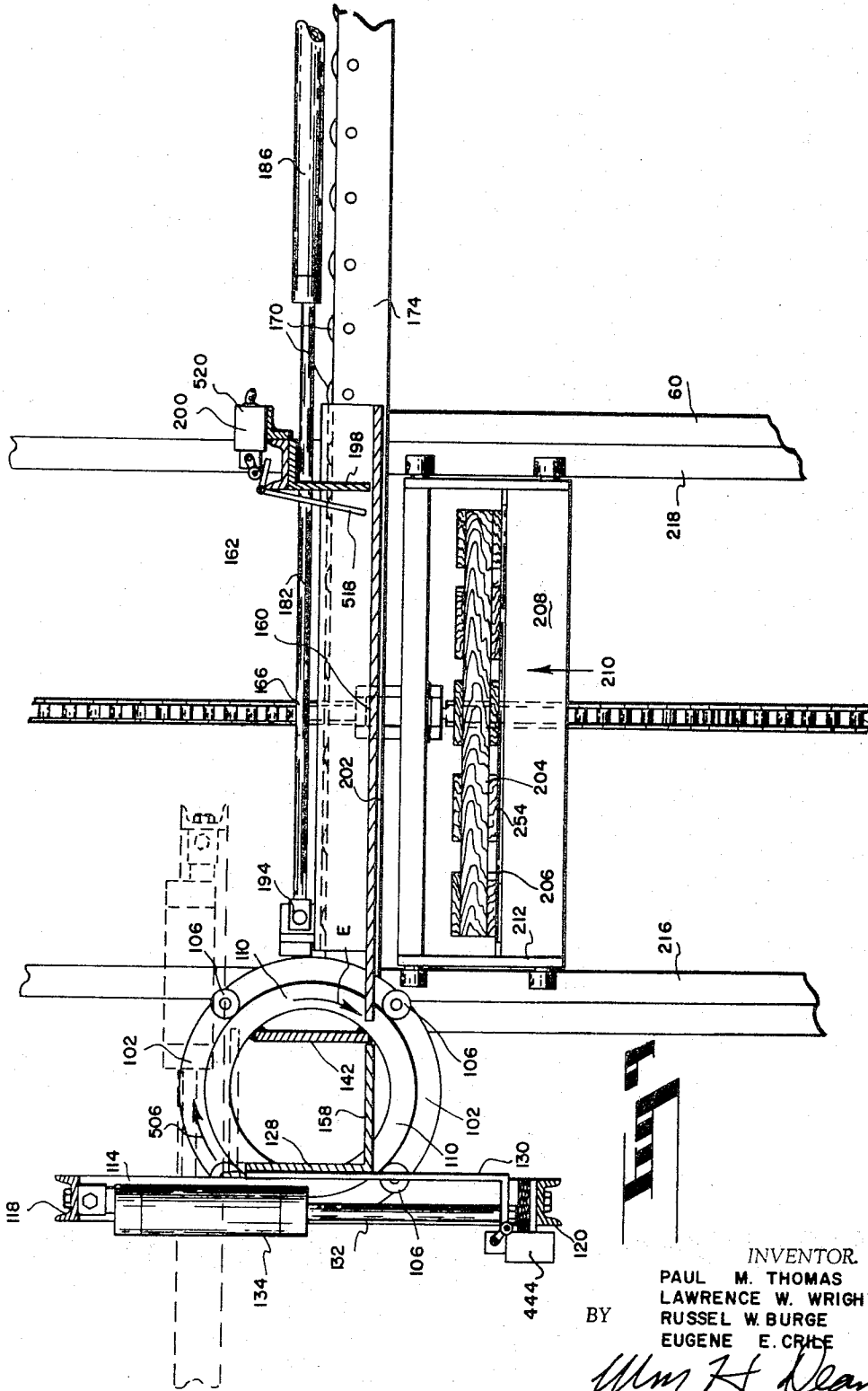
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24 Sheets-Sheet 7



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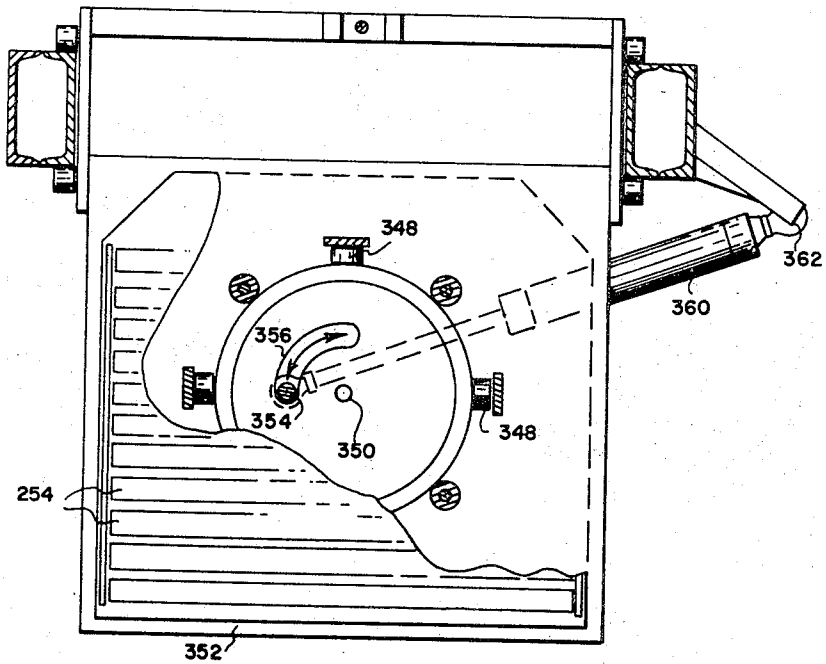
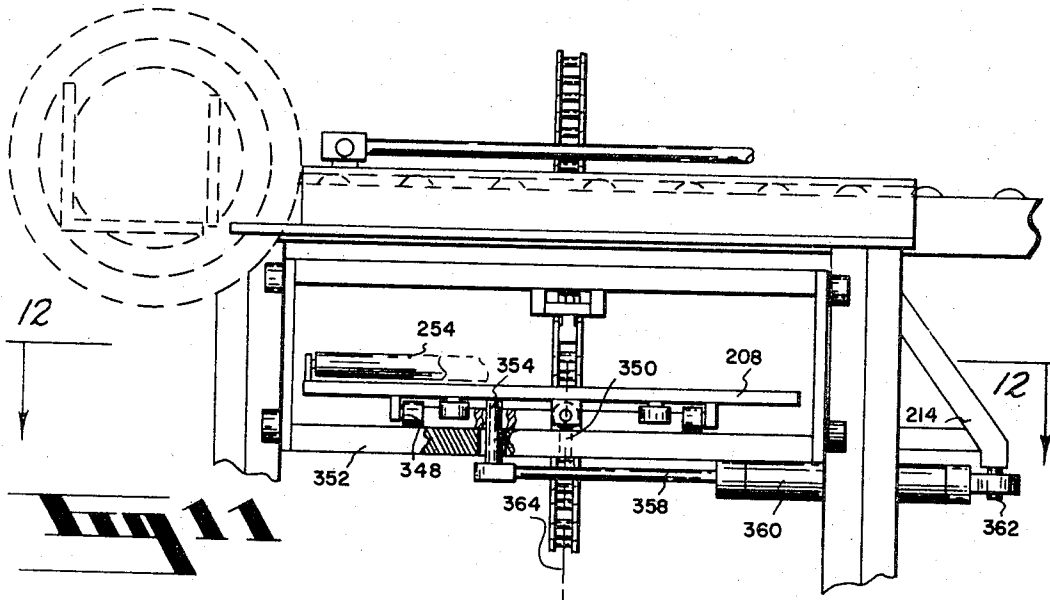
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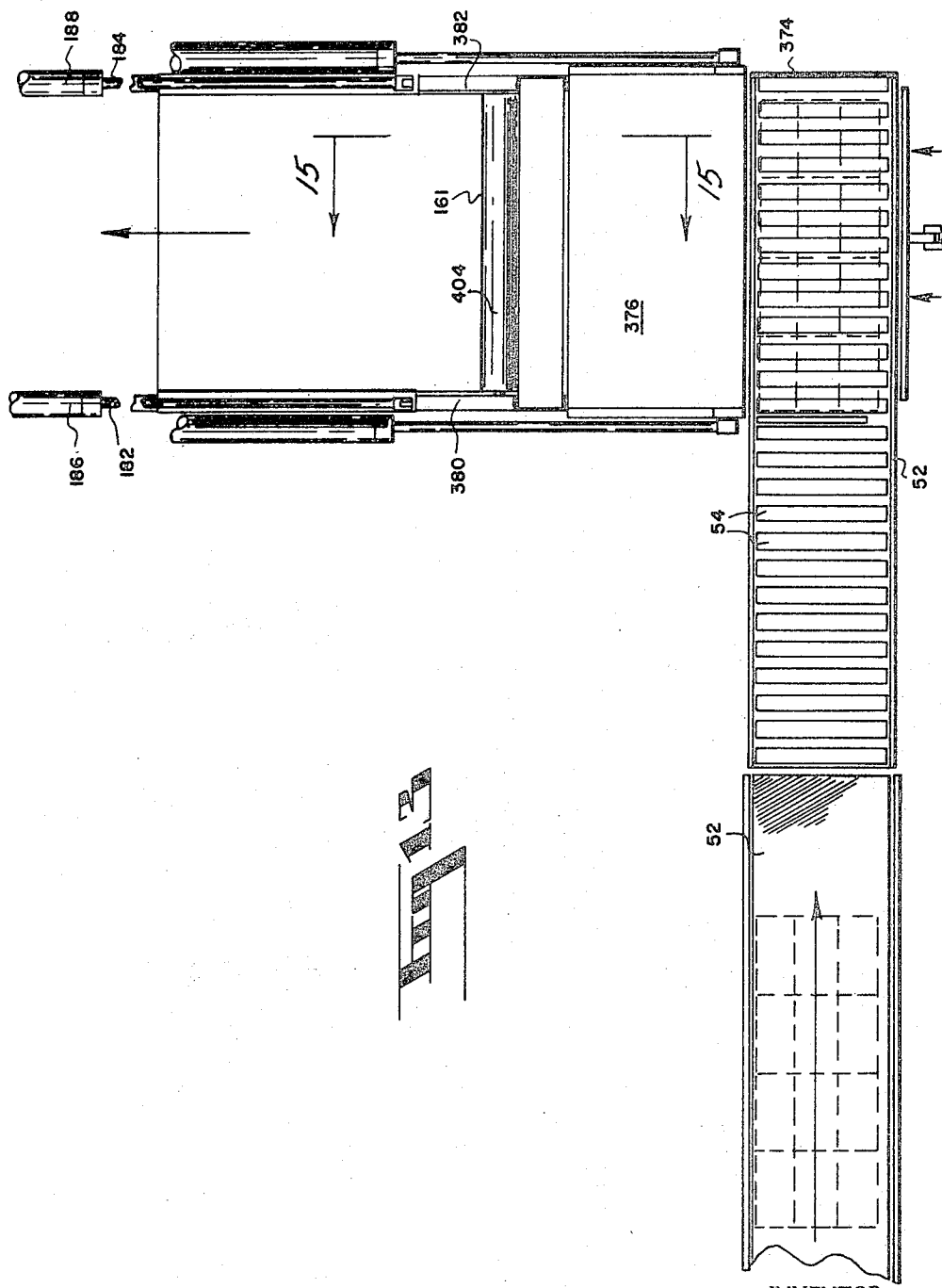
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24 Sheets-Sheet 10



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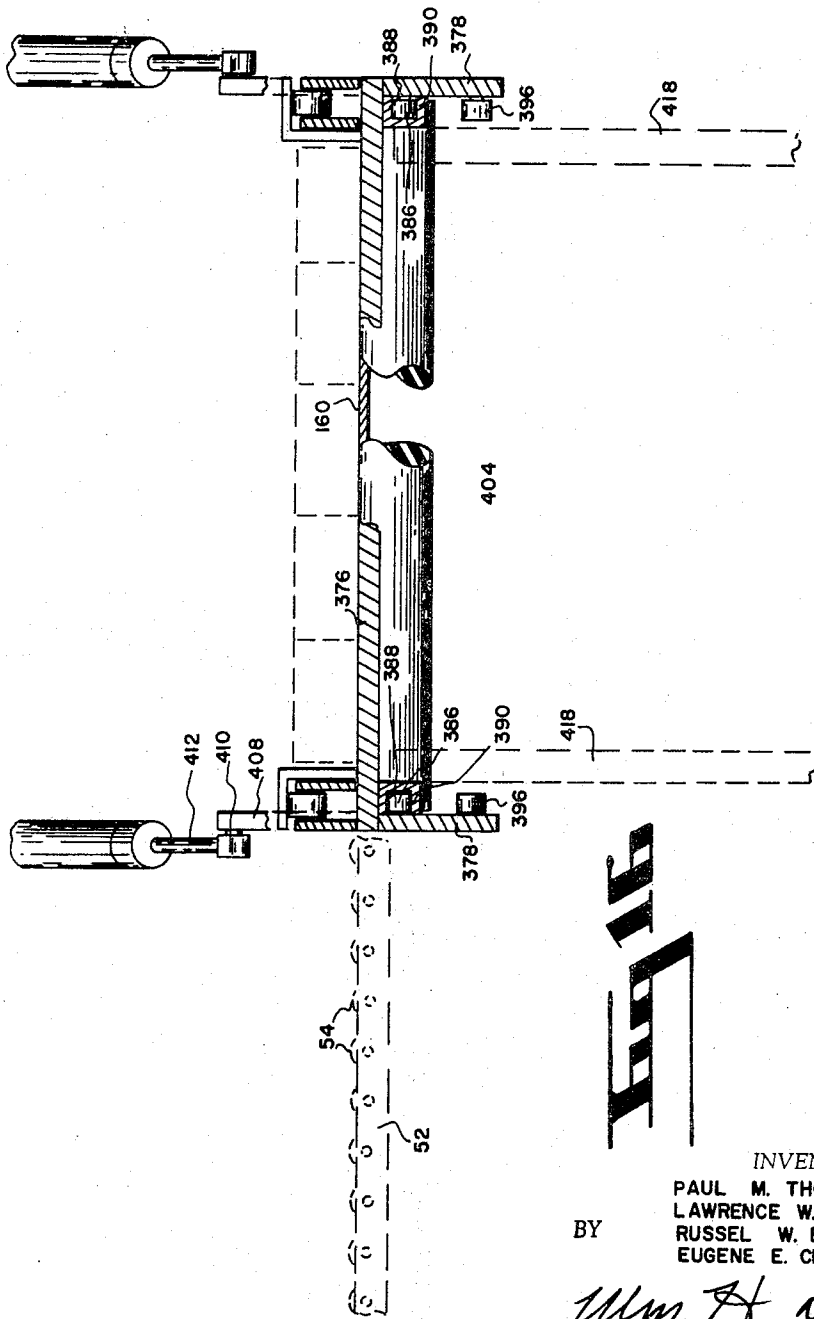
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24 Sheets-Sheet 12



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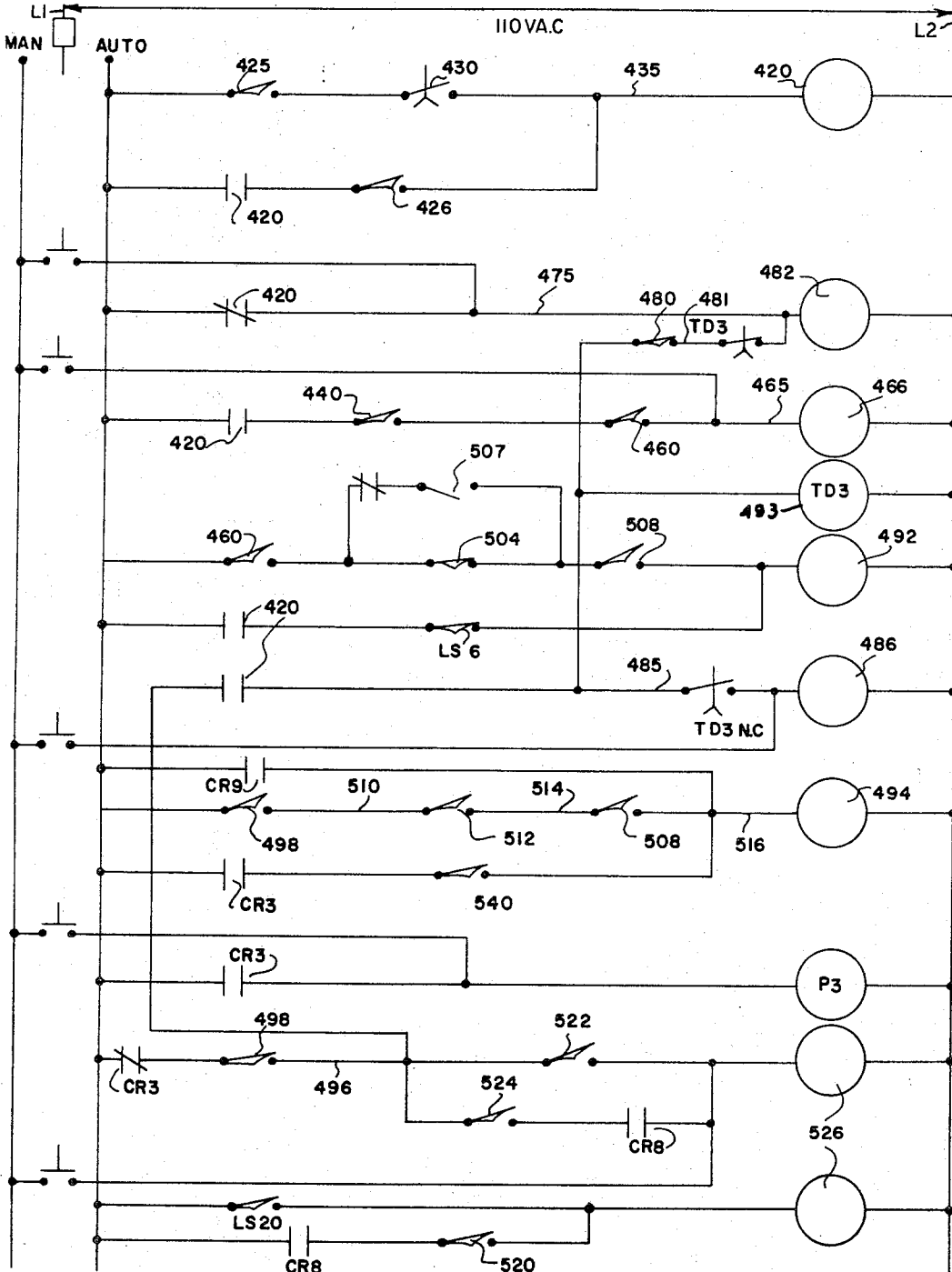
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24 Sheets-Sheet 14



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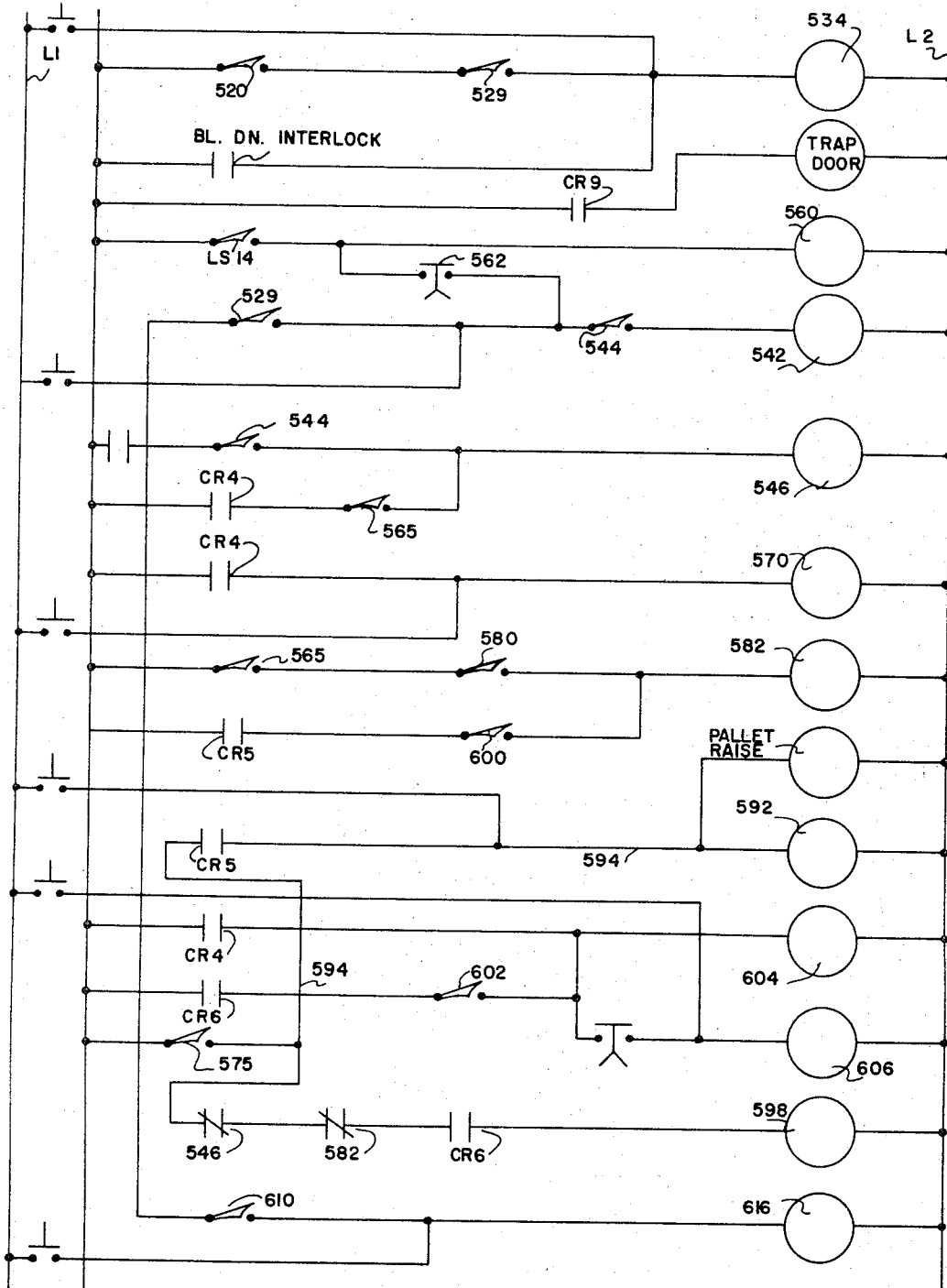
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24 Sheets-Sheet 15



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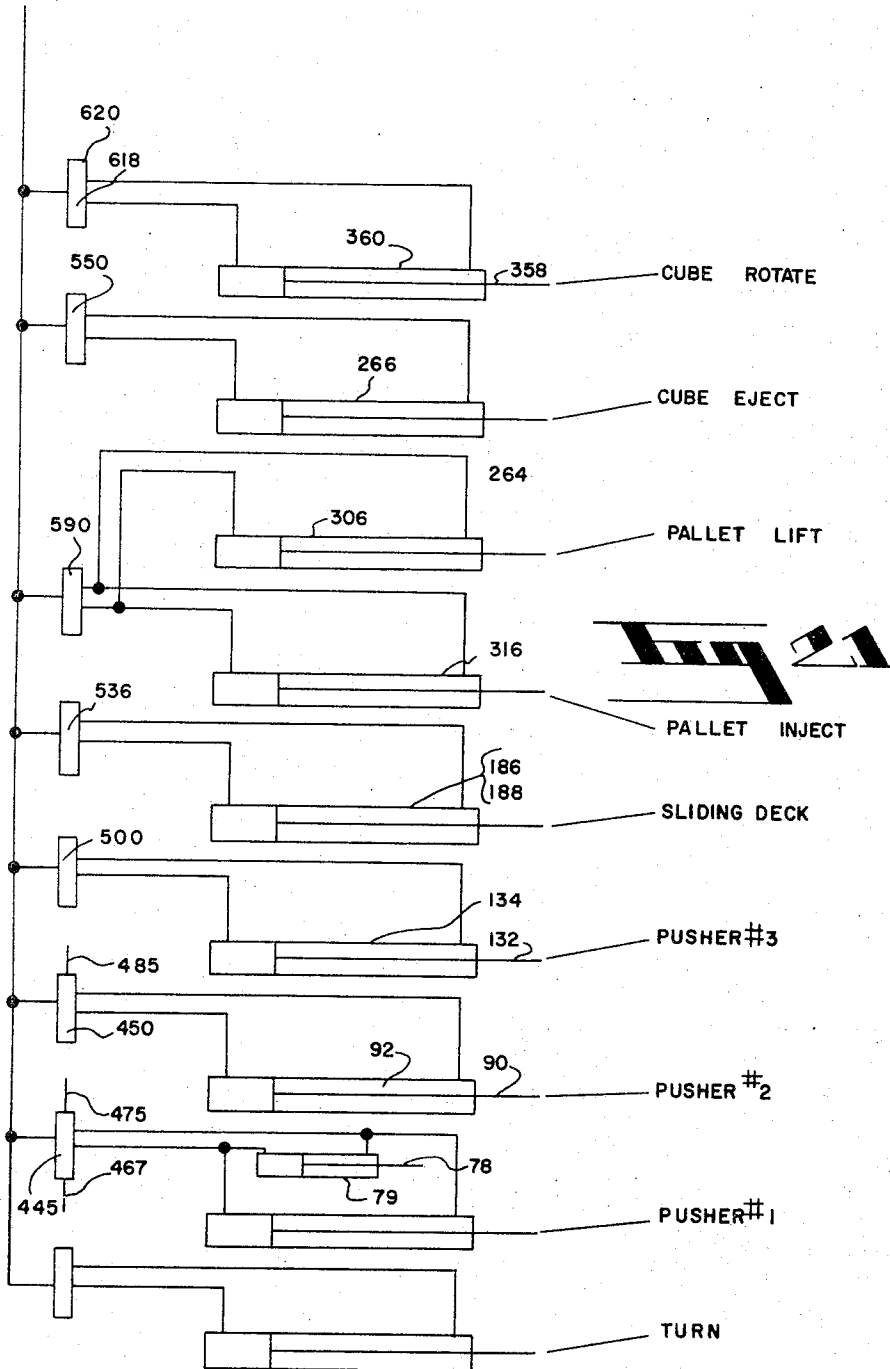
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24 Sheets-Sheet 16



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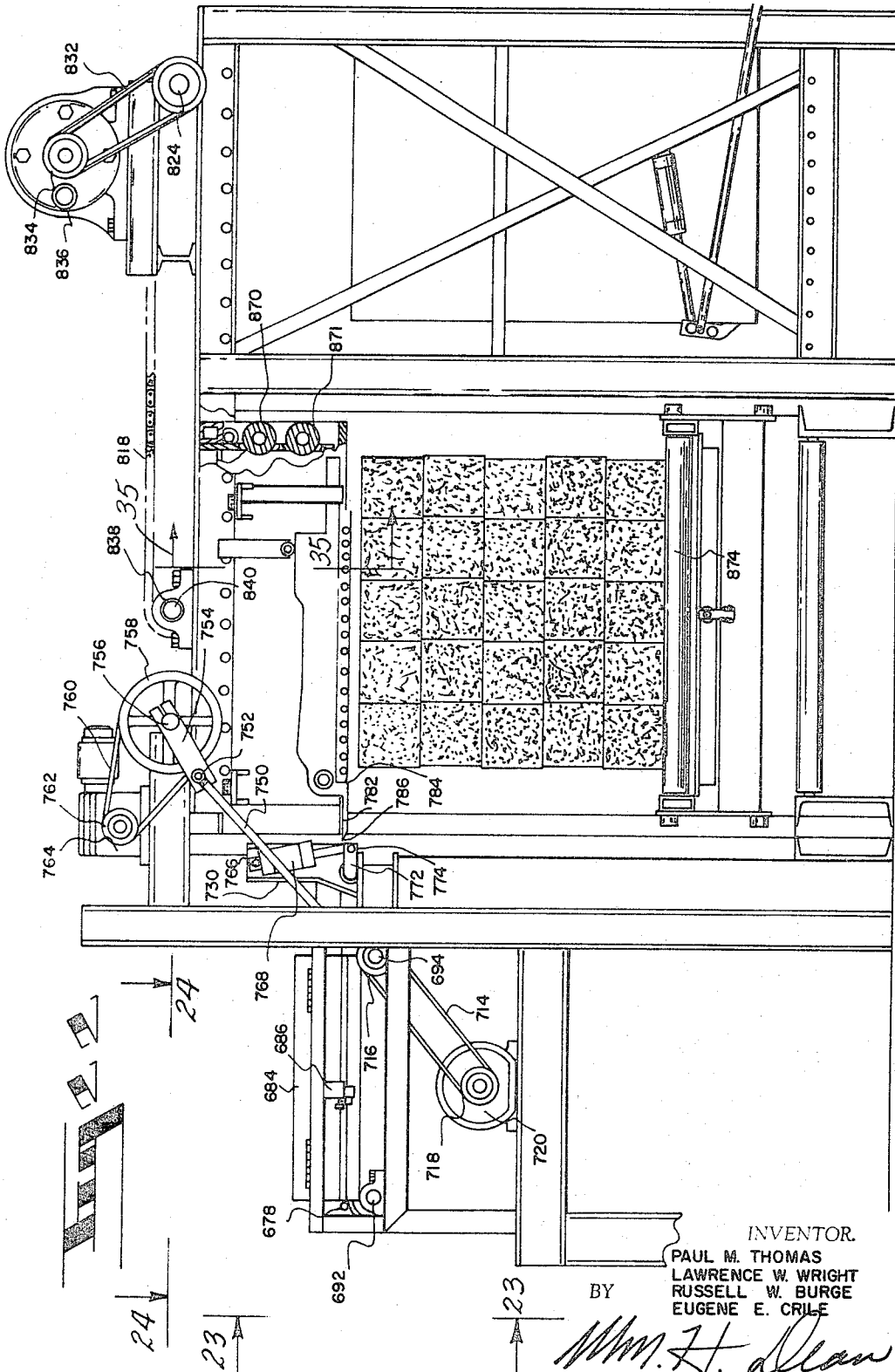
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24 Sheets-Sheet 17



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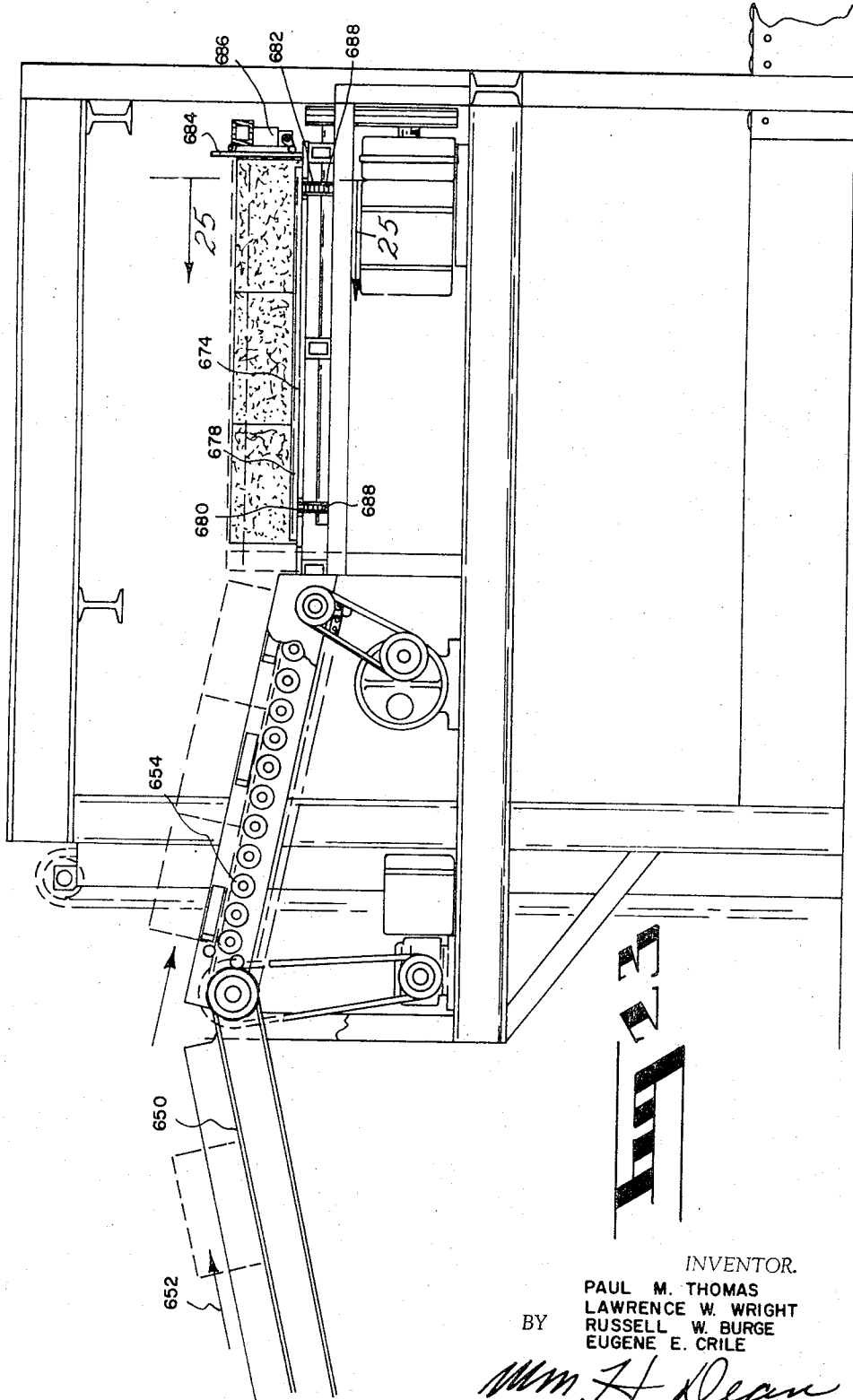
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24 Sheets-Sheet 18



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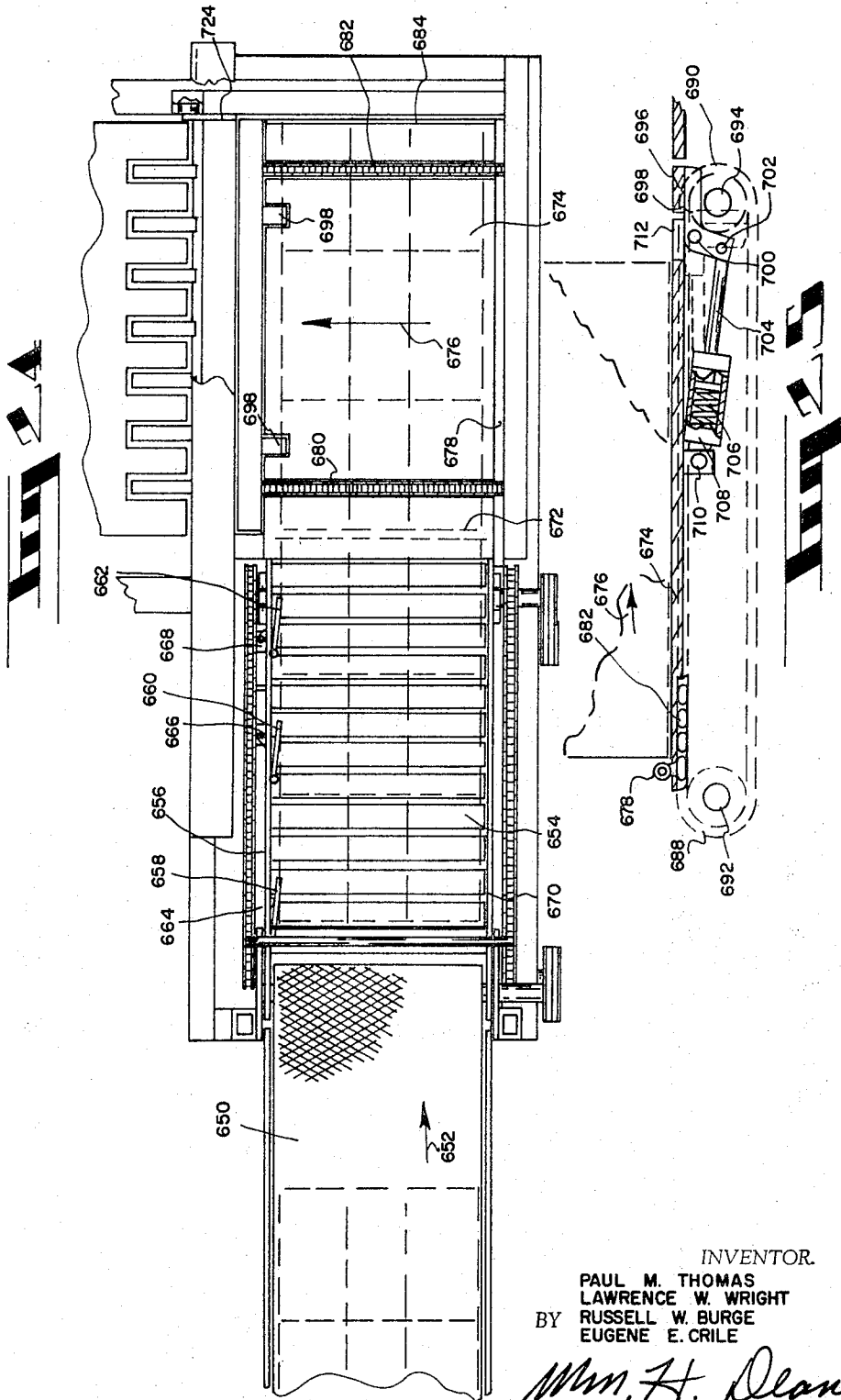
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24 Sheets-Sheet 19



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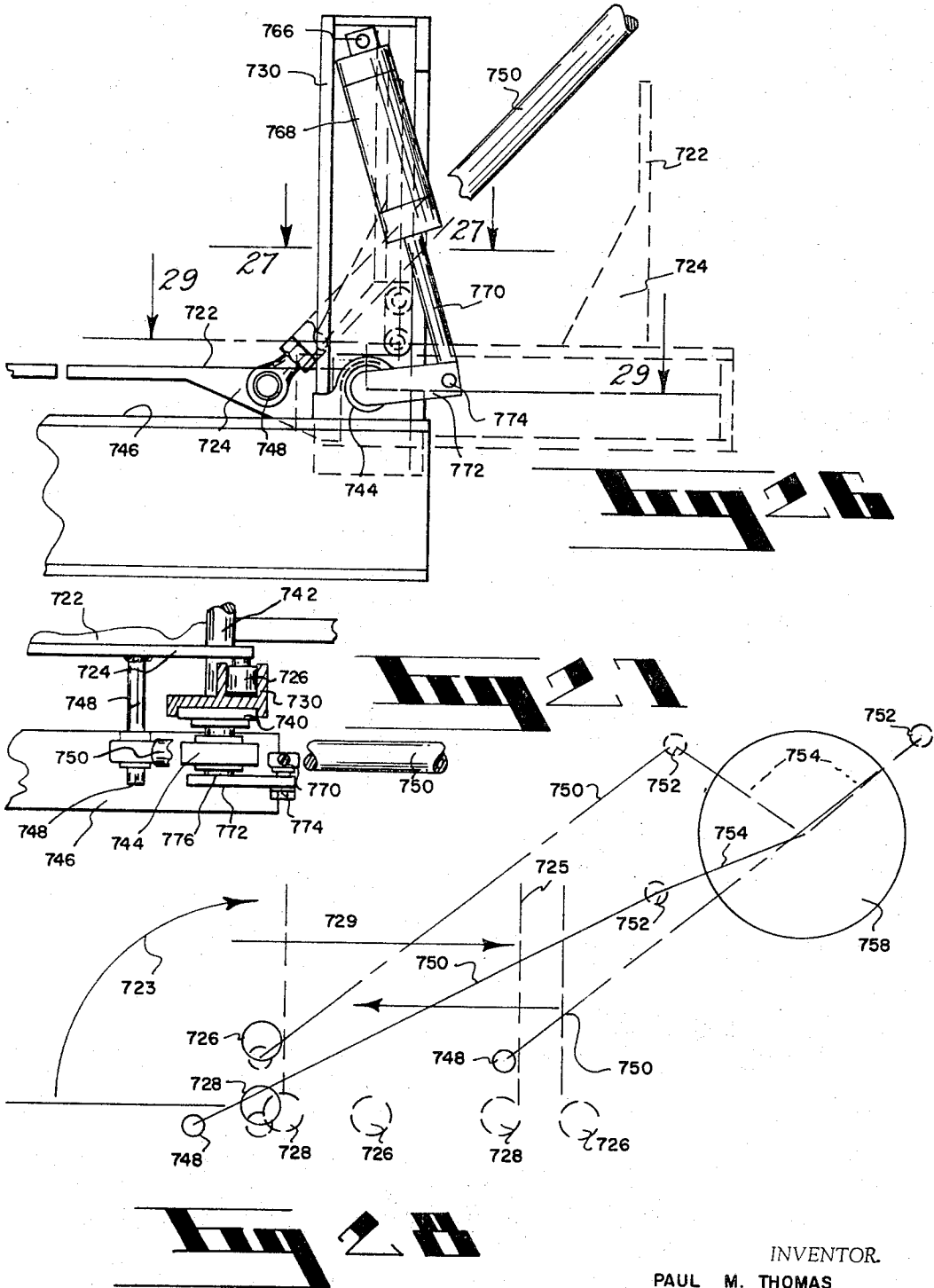
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24 Sheets-Sheet 20



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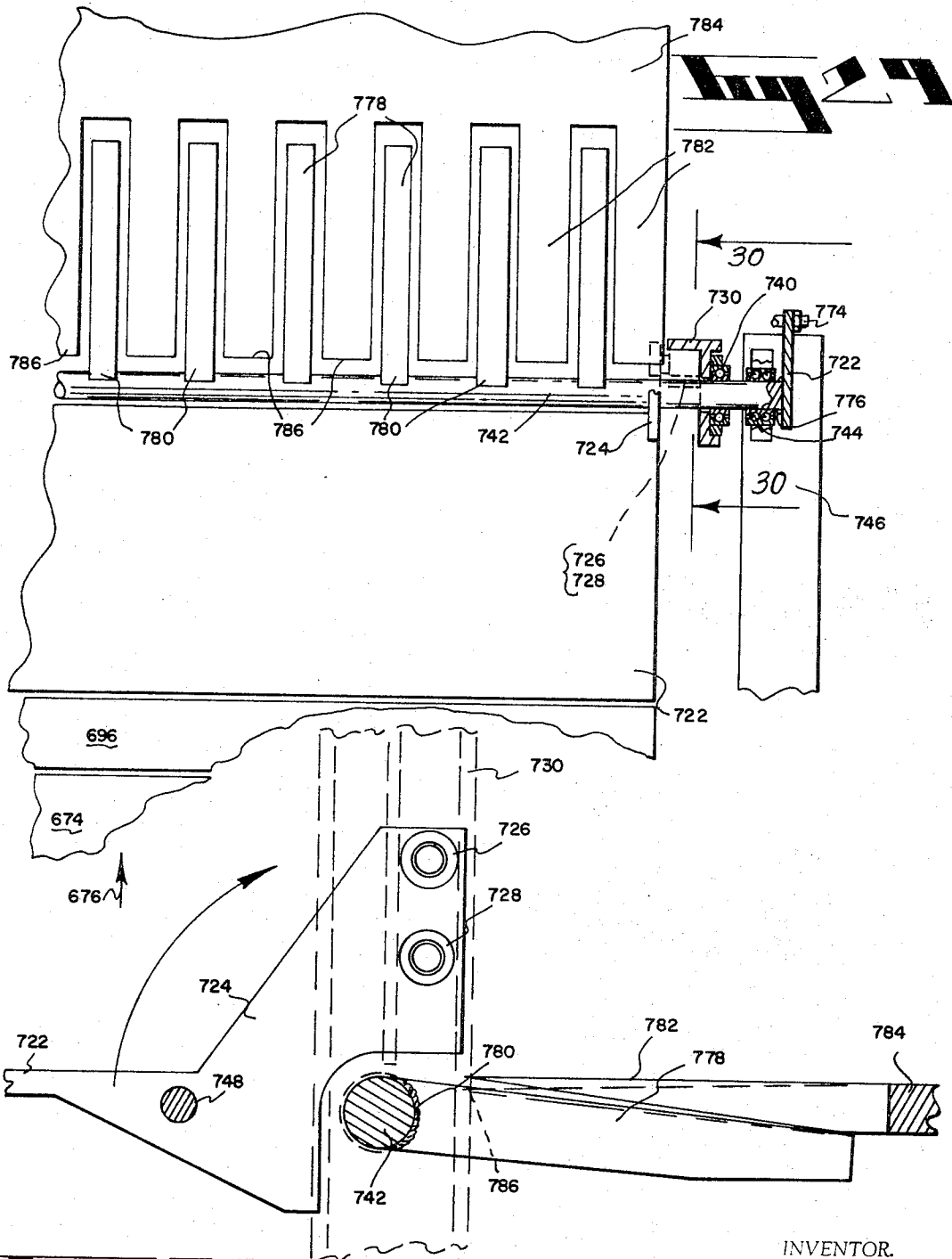
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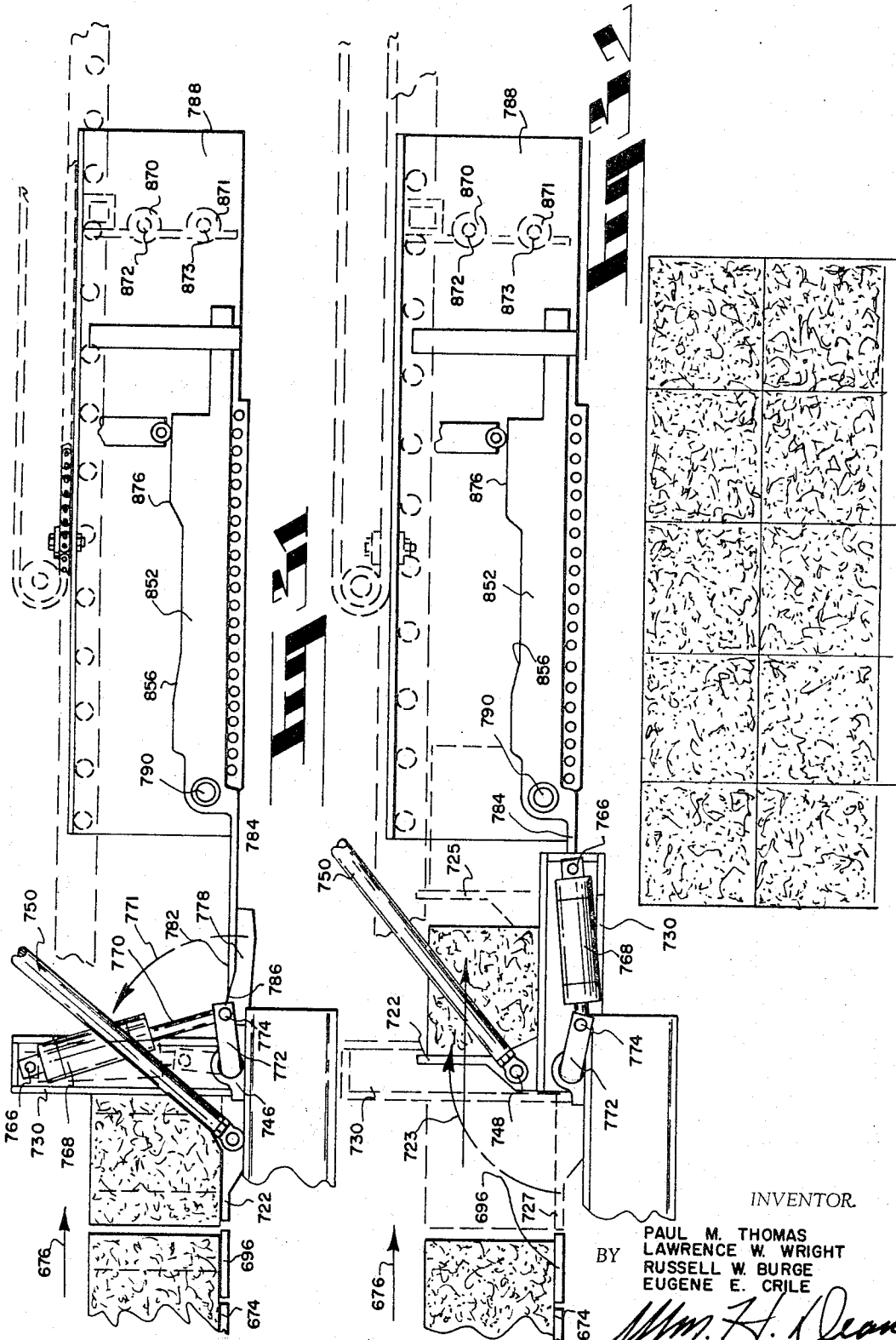
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CONCRETE BLOCK STACKING MACHINE

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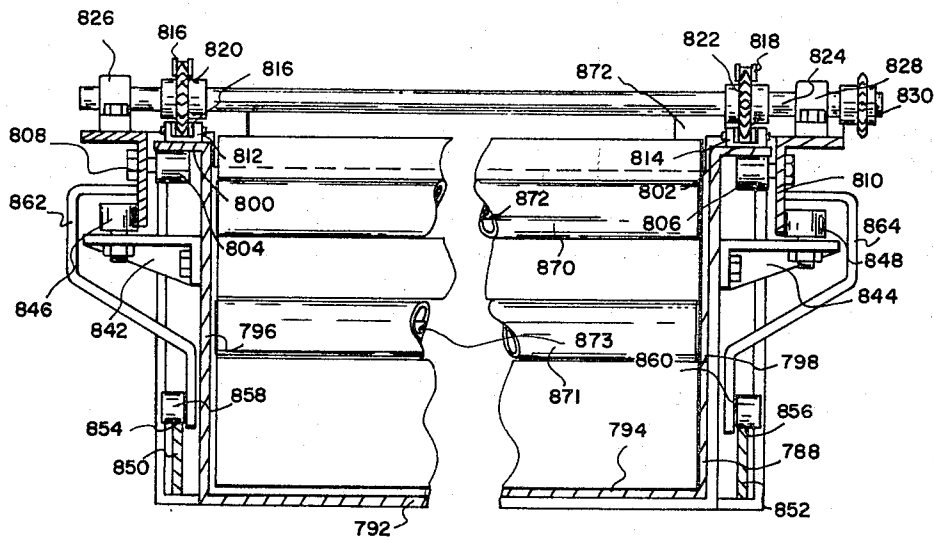
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24 Sheets-Sheet 24



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CONCRETE BLOCK STACKING MACHINE

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Filed Nov. 25, 1964, Ser. No. 413,710

9 Claims. (Cl. 214-6)

This application is a continuation-in-part of our co-
pending application, Ser. No. 345,956, filed Feb. 19,
1964.

This invention relates to a concrete block cubing machine, and, more particularly, to a concrete block cubing machine having means for selectively rotating concrete blocks substantially 90 degrees about a horizontal axis, said rotation being from a position in which the blocks are produced and cured to a position rotated substantially 90 degrees whereupon the normal core openings in the blocks are open horizontally to provide a lower layer of concrete blocks having their cored openings disposed in alignment with each other and in horizontal position so that the lowermost layer may be impaled by forks of a conventional lift truck for handling the cubes of blocks stacked above the said lowermost layer in order to dispense with the palletizing of the cubes of blocks, thus, stacked.

In the production of concrete blocks the industry has employed substantially automatic machines which produce concrete blocks on pallets around vertical core structures so that when the blocks are delivered from the machine they are in green condition and rest on the pallets with their core openings disposed vertically. The pallets carrying such green blocks are then either placed in racks or on conveyors and are either cured in steam curing rooms or may be cured under normal ambient conditions, if desired. The blocks when cured are usually stacked or arranged in cubical or rectangular stacks so that a lift truck may handle a great number of these blocks all at one time.

In the past, most of the stacking and cubing has been done by hand, and some machines have been developed for the purpose of stacking concrete blocks into a substantially rectangular stack.

While there are many types of concrete blocks, some of them must be stacked on pallets due to the fact that they do not have core openings sufficiently large to receive the forks of lift trucks, consequently, these concrete blocks must be placed on pallets. However, some of the standard building blocks, commonly known as 8" x 4" x 16" or 8" x 8" x 16" or any other similar blocks having fairly large core openings may be used with their core openings disposed horizontally and forming the lowermost layer of a cube or stack of blocks so that forks of a conventional fork lift truck may impale the lowermost layer of the blocks by forcing the forks through the core openings of such blocks and thereby picking up the cube of blocks. In this manner a large cube or rectangular stack of blocks may be carried about or loaded onto trucks, if desired, and the blocks may also be unloaded from trucks in this manner at various building sites.

It has been a problem to produce a simple, economical and reliable machine which may be used selectively to rotate concrete blocks from a position in which their cored openings are vertically disposed to a position in which their cored openings are horizontally disposed in order to form a lowermost layer of a rectangular or cubical stack of blocks so that when the stack of blocks is removed from the cubing machine the lowermost layer

will be disposed with the cored openings of the blocks horizontally aligned to receive the forks of a fork lift truck. Thus, many conventional blocks may be stacked for transport without the necessity of using a pallet under the cube or stack of blocks. Additionally, it has been a problem to provide a machine which is versatile in operation for handling various size blocks, and either stacking them in a rectangular stack or cube on pallets or without pallets, and further to rotate some of the blocks about a horizontal axis to dispose the lowermost layer of blocks in a stack so that their cored openings will be horizontally aligned to receive forks of conventional lift trucks.

Accordingly, it is an object of the present invention to provide a concrete block cubing machine having very simple and reliable means for stacking concrete blocks in a rectangular stack or cube and to rotate the first or lowermost layer of the blocks from a position in which their cored openings are vertically disposed to a position in which their cored openings are horizontally disposed and aligned to receive the handling forks of a conventional lift truck.

Another object of the invention is to provide a very simple and reliable concrete block cubing machine which is readily adapted for use in stacking or cubing concrete blocks, either on a pallet or without a pallet, wherein the lowermost layer of blocks when without a pallet is disposed such that the cored openings in the blocks are aligned horizontally to receive the forks of a conventional lift truck.

Another object of the invention is to provide a novel concrete block cubing machine which is capable of rotating blocks about a horizontal axis after being received from a conveyor and before being placed in a rectangular stack or cube, said machine also being capable of handling various sized blocks and thicknesses of blocks in the same horizontal axis rotating mechanism without manual adjustment or change.

Another object of the present invention is to provide a concrete block cubing machine which is capable of handling and stacking or cubing a great number of concrete blocks within a given length of time.

Another object of the invention is to provide a concrete block cubing machine which may very readily and easily be adapted for use in stacking or cubing articles other than concrete blocks when it is desired to receive such articles from a conveyor and rotate them about a horizontal axis preliminary to the placement of the articles in a rectangular stack or cube assembly.

Another object of the invention is to provide a concrete block cubing machine having a novel horizontal axis rotating means for rotating blocks substantially 90 degrees about a horizontal axis from a position in which their cored openings are vertical to a position in which their cored openings are horizontal, and also to provide novel means for controlling the operation of such machine.

Another object of the invention is to provide a concrete block cubing machine having an elevator disposed to be movable vertically in increments equal to the dimensions of concrete blocks and to receive superimposed layers of concrete blocks, one upon the other, and wherein novel means is provided for controlling the vertical movement of the elevator with relation to the means of the machine for depositing layers of concrete blocks, one upon the other, in superimposed relationship on said conveyor.

Another object of the invention is to provide a concrete block cubing machine utilizing a novel time delay control system for initiating operation of a vertically mov-

able elevator after a block layer depositing plate has deposited a layer of blocks on the elevator.

Another object of the invention is to provide a concrete block cubing machine having a novel block cube or stack receiving elevator operable in vertical increments equal to the dimensions of the blocks, and wherein photo electric means is utilized to control vertical movement of the elevator with relation to the disposition of layers of concrete blocks on the elevator.

Another object of the invention is to provide a concrete block cubing machine having a novel cooperative arrangement between pallet magazine mechanism comprising a pallet feed operable from the bottom of a stack of pallets in the magazine and an elevator disposed to receive the pallets and to load blocks on the pallets and to deliver the pallets with a rectangular stack or cube of blocks thereon.

Another object of the invention is to provide a concrete block cubing machine having novel means for successively depositing layers of concrete blocks on the top of a cube being formed by the machine; said novel means comprising a pivotal member having a substantially feathered edge which may progressively be withdrawn from a layer of concrete blocks to deposit them on the surface of a layer of concrete blocks on the top of a cube being formed; said feathered edge being thin to permit the blocks to slide therefrom and be deposited on the top of the uppermost layer of the blocks in the cube being formed to prevent each layer of blocks being placed on the cube from falling a substantial distance whereby chipping or cracking of the blocks as they are placed on the cube is substantially alleviated.

Another object of the invention is to provide improvements, as set forth in the immediately preceding object, wherein a feathered edge mechanism is used for depositing layers of concrete blocks on the top of a cube of blocks being formed and wherein novel pivotal mechanism is controlled by cam means for very accurately disposing a feathered edge block depositing means in contiguous relation with upper surfaces of blocks on a cube being formed so that blocks being placed on the top of the cube being formed are very gently deposited thereon as they are gradually slid from the feathered edge mechanism in very close proximity to the blocks on the top of the cube being formed.

Another object of the present invention is to provide improved means for rotating blocks from a vertical axis core opening position to a horizontal axis core opening position preliminary to their disposition on a cube of blocks being formed by the machine.

A further object of the invention is to provide a concrete block cubing machine in which an elevator on which cubes of blocks are formed is alternately movable upward and downward during each cube layer depositing cycle of the machine in order to cooperate with a novel feather edge block depositing mechanism according to the foregoing objects of the invention, whereby the uppermost layer of blocks in a cube being formed may accurately cooperate with the feather edge depositing mechanism of the invention in order to provide for gentle handling of the blocks during the forming of a cube thereof and to thereby reduce cracking or chipping of the blocks to a minimum.

Further objects and advantages of the invention may be apparent from the following specification, appended claims and accompanying drawings, in which:

FIG. 1 is a side elevational view of a concrete block cubing machine in accordance with the present invention;

FIG. 2 is a top or plan view of the machine taken from the line 2—2 of FIG. 1;

FIG. 3 is a sectional view of the invention taken from the line 3—3 of FIG. 2;

FIG. 4 is a view of the machine taken from the line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary perspective view of block turning mechanism of the machine operable on a horizontal axis for turning blocks substantially ninety degrees from a position as received from a conveyor to a position in which the blocks will be disposed in a cube;

FIG. 6 is a fragmentary sectional view taken from the line 6—6 of FIG. 2;

FIG. 7 is a sectional view taken from the line 7—7 of FIG. 6;

FIG. 8 is a sectional view taken from the line 8—8 of FIG. 2;

FIG. 9 is a sectional view taken from the line 9—9 of FIG. 2;

FIG. 10 is a fragmentary side elevational view of the right hand end of the machine, as shown in FIG. 1 of the drawings, and showing portions broken away and in section to amplify the illustration;

FIG. 11 is a view of a modified structure of the elevator of the machine of the invention showing a rotatable platform mechanism for the elevator pivotally operable and movable about a vertical axis;

FIG. 12 is a sectional view taken from the line 12—12 of FIG. 11;

FIG. 13 is a plan view of a modified structure of the present invention showing a conveyor, a conveyor unloader and a modified block turning device operable on a horizontal axis to turn blocks substantially ninety degrees from a position as received by the conveyor to a position in which the blocks will be disposed in stacks or cubes;

FIG. 14 is a fragmentary sectional view taken from the line 14—14 of FIG. 13;

FIG. 15 is an enlarged fragmentary sectional view of the modified block turning mechanism taken from the line 15—15 of FIG. 13;

FIG. 16 is a fragmentary sectional view taken from the line 16—16 of FIG. 15;

FIG. 17 is an enlarged plan view taken from the line 17—17 of FIG. 4 showing a cube ejecting mechanism of the invention;

FIG. 18 is a view of the mechanism shown in FIG. 17 and taken from the line 18—18 of FIG. 17;

FIG. 19 is a diagrammatic view of a portion of the electrical equipment of the machine of the invention;

FIG. 20 is a continuation of the disclosure of the electrical equipment of the machine, as shown in FIG. 17;

FIG. 21 is a diagrammatic view of the pressure fluid cylinder actuator mechanisms of the machine together with the related solenoid control valves and a pressure fluid supply;

FIG. 22 is a view similar to FIG. 1, but showing modifications of the present invention particularly with respect to mechanism used to turn blocks from a vertical core opening position to a horizontal core opening position and also with respect to improvements relating to the means for depositing layers of blocks on the uppermost layers in cubes of blocks being formed by the machine;

FIG. 23 is a view taken of the modified structure of the machine from line 23—23 of FIG. 22 and showing portions broken away and in section to amplify the illustration;

FIG. 24 is a fragmentary plan view taken from the line 24—24 of FIG. 22 and showing portions of the machine mechanism broken away to amplify the illustration;

FIG. 25 is an enlarged fragmentary sectional view taken from the line 25—25 of FIG. 23 showing a spring loaded pivotal gate adapted to permit block pusher bar mechanism of the invention to escape through a block supporting table from the upper surface of the table to the lower surface thereof;

FIG. 26 is an enlarged fragmentary side elevational view of block turnover mechanism viewed in the same direction as that shown in FIG. 22 and illustrating by broken lines varying positions of the mechanism as it re-

lates to the turning of blocks from a vertical core opening position to a horizontal core opening position;

FIG. 27 is a fragmentary plan sectional view taken from the line 27—27 of FIG. 26;

FIG. 28 is a diagrammatic view of the relative motion of machine elements of the turnover mechanism, as shown in FIG. 26;

FIG. 29 is a fragmentary plan sectional view taken from the line 29—29 of FIG. 26;

FIG. 30 is an enlarged fragmentary sectional view taken from the line 30—30 of FIG. 29;

FIG. 31 is a side elevational view of block turnover mechanism similar to that shown in FIG. 26, but shown on a reduced scale and also shown in relation to a feather edge block depositing mechanism of the invention;

FIG. 32 is a view similar to FIG. 31, but showing a varying position of the block turnover mechanism, shown in FIG. 31;

FIG. 33 is a view similar to the views in FIGS. 31 and 32, but showing a varying position of the feather edge block depositing mechanism in the functional position of depositing a layer of concrete blocks on an uppermost layer of blocks in a cube being formed by the machine;

FIG. 34 is a view similar to FIG. 33 showing a feather edge mechanism, shown in FIG. 33, at a completion of its cycle in depositing a layer of blocks on an uppermost layer of blocks in a cube being formed by the machine; and

FIG. 35 is a sectional view taken from line 35—35 of FIG. 22.

As shown in FIGS. 1 and 2 of the drawings, the concrete block cubing machine of the invention is provided with a horizontal roller platform 50 which receives concrete blocks A from a conveyor 52 moving the blocks in the direction of an arrow B, shown best in FIG. 2 of the drawings. The blocks, when carried on the conveyor 52, are in a position wherein their core openings C are disposed vertically. The conveyor 52 is a belt type conveyor of endless form, or any other suitable conveyor which will deliver the blocks A onto the roller platform 50, which consists of a plurality of closely spaced rollers having their axes horizontally and the rollers being disposed in such a manner that their peripheries are substantially on a horizontal plane with the upper surface of the conveyor 52.

The rollers of the platform 50 are designated 54, and, as shown in FIG. 3 of the drawings, they are provided with axles 56 mounted on frame elements 58 of the main frame 60 of the machine. Thus, the roller platform 54 is a stationary platform disposed to provide a minimum of resistance to the receiving of the blocks from the conveyor 52.

Adjacent ends 62 of the rollers 54 is a platform 64 having an upper surface disposed on a plane of the upper peripheral portions of the rollers 54, this platform 64 being shown in FIGS. 2, 6 and 7 of the drawings.

Disposed above the roller platform 50 and the platform 64 is a frame structure 66 supporting guide rods 68 which are axially horizontal. Slidably mounted on these guide rods 68 are slide bearings 70 carrying a substantially vertical pusher plate 72 which is provided with a lower edge 74 barely clearing the upper peripheries of the platform rollers 54 and the upper surface of the platform 64. This pusher 72 is connected by means of a pin 76 to the plunger 78 of an actuating cylinder carried by an outboard portion 80 of the frame structure 66. Thus, the pusher plate 72 is disposed to force blocks A from the roller platform 54 axially of the rollers and onto the upper surface of the platform plate 64 which is supported by a stationary portion 82 of the main frame 60. It will be seen that each block A, as shown in FIG. 6 of the drawings, is received on the conveyor 52 in a position wherein the cored opening C is aligned with a vertical axis D, all as shown best in FIG. 6 of the drawings.

Disposed at right angles to the guide rods 68 are further guide rods 84 on which slide bearings 86 are reciprocally mounted. These slide bearings 86 support a pusher plate 88 which is coupled to a plunger 90 of a pressure fluid cylinder 92 anchored by a pin 94 to the frame element 82 of the main frame. The guide rods 84 and cylinder 92 are axially disposed substantially at right angles to the guide rods 68, and the respective actuating cylinder plunger 78, hereinbefore described.

The pusher plate 88 is disposed to slide concrete blocks from the platform 64 onto a horizontal axis block turning mechanism 96, shown best in FIGS. 1, 5, 6, 7, 8 and 9 of the drawings. This block turning mechanism 96 is provided with frame structures 98 and 100 forming part of the main frame 60. These frame structures 98 and 100 carry respective ring bearing supports 102 and 104 on which annular rows of roller bearings 106 and 108 respectively are mounted. Internally of these annular rows of rollers 106 and 108, respectively, are rotatable bearing rings 110 and 112, respectively, having their peripheries held captive and rotatably mounted in the annular rows of the bearings 106 and 108, respectively.

Fixed to the rings 110 and 112 are channel members, or other suitable frame elements, 114 and 116, respectively. These members 114 and 116 may be arc welded or otherwise secured to the bearing rings 110 and 112, and support complementary frame members 118 and 120 forming a substantially rectangular frame which carries guide rods 122 and 124 having slide bearings 126 and 128 slidably longitudinally thereof.

Supported on these slide bearings 124 and 126 is an L-shaped plate structure 128 to which an arm 130 is fixed and connected to a plunger 132 of a fluid pressure cylinder 134 by means of a bolt 136. The pressure fluid cylinder 134 is pivotally mounted by means of a pin 138 to clevis structure 140 carried by the frame element 118.

A plate 142, as shown in FIGS. 7 and 8, is fixed to the rings 110 and 112 and is disposed to be rotated into alignment with and on a common plane with the platform 64 so that the pusher 88 may slide blocks directly from the platform 64 onto the upper surface of the plate 142.

Fixed to the plate 142 at an extended portion 144 thereof is a trunnion 146 engaged by a bearing 148 on a plunger 150 of a pressure fluid cylinder 152 pivotally mounted on a pin 154 secured to a stationary element 156 of the main frame 60 of the machine. The pressure fluid cylinder 152 is, thus, capable of extending and retracting its plunger 150 to rotate the rings 110 and 112 and the plate 142 together with the entire mechanism 96 about a horizontal axis concentric with the rings 110 and 112. In this manner, the rings 110 and 112, plate 142, L-shaped plate 128 and the frame members 114, 116, 118 and 120 together with the cylinder 134 all rotate about a horizontal axis concentric with the rings 110 and 112. Thus, the frame composed of the elements 114, 116, 118 and 120 may be positioned in a horizontal disposition, as shown in FIG. 5 of the drawings, or may be disposed vertically, as shown in FIG. 9 of the drawings, and concrete blocks may be pushed by the pusher 88 from the platform 64 onto the plate 142, as shown in FIG. 7 of the drawings, or they may be pushed onto a side 158 of the L-shaped plate structure 128, as shown in FIG. 9 of the drawings. It will be seen that when blocks are received on the plate portion 158, as shown in FIG. 9 of the drawings, that the blocks are slid by the pusher 88 from the platform plate 64 and that the blocks on the plate 158 are in the same position as received on the conveyor 52 by the roller platform 50. With actuation of the pressure fluid cylinder 152 to extend its plunger 150, the bearing rings 110 and 112 may be rotated in a direction of an arrow E, shown in FIG. 9 of the drawings, to a position, as shown in FIG. 8 of the drawings, to thereby place a concrete block in such position that the cored openings C are in a horizontal position whereby operation of the pressure fluid cylinder 134 to retract its plunger 132

will move the plate 158 and the concrete block thereon into a position upon a slide plate 160 which is provided for depositing layers of concrete blocks on a vertical elevator of the machine, as will be hereinafter described in detail.

When the machine of the invention is utilized to stack concrete blocks in rectangular stacks or cubes, and when the blocks A, as shown in FIGURE 3 of the drawings, are of the type having the cored openings C, it is not necessary to employ a pallet since a lowermost layer of blocks in a cube, as will be hereinafter described, may be disposed with the cored openings horizontally, as shown in FIG. 3 of the drawings, ultimately to receive the forks of a conventional fork lift truck for handling the cube of blocks as desired. Accordingly, it will be seen when the pusher 88 pushes the blocks from the platform plate 64 onto the plate 158 in the position as shown in FIG. 9 of the drawings, that the plate may be rotated by operation of the cylinder 152, as hereinbefore described, into such position that the plate 158, as shown in FIG. 8 of the drawings, carries the blocks to a position in which their cored openings C are horizontally disposed, as shown in FIG. 3, and thus a lower layer of blocks may be formed as hereinbefore described.

Subsequent layers of blocks may be transferred to a position on top of the blocks, as shown in FIG. 3 of the drawings, without rotating them and in this position the blocks may be received from the platform 64 directly onto the plate 142, as shown in FIGS. 7 and 8 of the drawings, and subsequently pushed off onto a slide plate 160 which loads layers of blocks onto an elevator in the position of the blocks as shown in FIG. 3 of the drawings.

The blocks either in a vertical core opening position or in a horizontal core opening position adjacent the plates 142 or 158, respectively, may be moved off the plate 142 in the direction of an arrow F, as shown in FIG. 8 of the drawings, by actuation of the pressure fluid cylinder 134 to retract its plunger 132 and the arm 130 together with the plate assembly 128 and to move it toward the slide plate 160 to slide the blocks A from the plate 142 onto the slide plate 160 either when the blocks are disposed adjacent the plate 158 with their cored openings horizontally, or in a position on the plate 142, with their cored openings vertically. Accordingly, the rotating assembly or block turning assembly 96 may be used to rotate blocks 90 degrees about a horizontal axis only to form a first or lowermost layer of a cube of blocks and then subsequently the turning assembly 96 may not be rotated to load the remainder of the cube of blocks onto the slide plate 160 for transferring the layers of blocks onto a stack carried by the elevator of the invention, as will be hereinafter described in detail.

The slide plate 160, as shown in FIG. 8 of the drawings, is also disclosed in FIGS. 1, 2 and 9 of the drawings. This slide plate 160 is a substantially horizontal flat plate substantially coextensive in width with the length of the plates 142 and 128. Opposite edges of the slide plate 160 are provided with vertical flanges 162 and 164 integral with horizontal flanges 166 and 168. These flanges 166 and 168 are carried respectively by rollers 170 and 172 rotatably mounted on horizontal frame members 174 and 176, respectively, of the main frame of the machine. The slide plate 160 is provided with a receiving edge 178 disposed to be actuated into position adjacent the plate 142 at its edge 180, and the slide plate 160 is disposed to be retracted away from the edge 180 by means of plungers 182 and 184 of pressure fluid cylinders 186 and 188, respectively. The pressure cylinders 186 and 188 are pivotally mounted on the frame of the machine by pins 190 and 192 and the plungers 182 and 184 are connected to upstanding bearing plates 194 and 196 fixed to the horizontal flanges 166 and 168 of the slide plate 160.

Extending across the slide plate 160 and located thereabove is a screed bar 198 which is supported by a sta-

tionary cross member 200 of the main frame 60. This screed bar 198 is disposed to be engaged by a layer of blocks to hold them stationarily with respect to the frame 60 of the machine so that the slide plate 160 may be retracted from beneath the layer of blocks when this layer is held stationarily by the screed bar 198, and when the slide plate is thus retracted the layer of blocks may be dropped onto an upper surface 202 of a pallet structure 204, or, in the absence of the pallet, the layer of blocks may be directly dropped onto an upper surface 206 of a platform 208 of an elevator generally designated 210 in the drawings. The platform 208 is supported in cantilever fashion from carriage frames 212 and 214 having rollers which traverse vertical frame tracks 216 and 218, respectively. The carriage plates 212 and 214 are similar, therefore, the carriage plate 212 will be described herein in detail. This plate 212 is provided with a pair of rollers 220 running on a track 222 at one vertical side of the structure 216, and the plate 212 is provided with another pair of rollers 224 running on a vertical track 226 opposed to the track 222, thereby maintaining the platform 208 in horizontal cantilever position. The vertical track structures 216 and 218 are rigidly connected to a frame base structure 228 comprising a pair of spaced box sections 230 and 232 which are below the track structures 216 and 218.

A bar 234 interconnects the plates 212 and 214, as shown in FIG. 4 of the drawings, and connected to this bar 234 is a chain connection 236 connecting one end of a chain 238 to the elevator platform of the invention, while another chain fixture 240 fixed to the bar 234 connects the opposite end of the chain 238 to the elevator platform.

Vertical extensions of the track frame structures 216 and 218 are connected at their upper ends to a cross member 242 on which a sprocket 244 is rotatably mounted. The chain 238 passes over this sprocket 244 and also over another sprocket 246 near the lower end of the machine, this sprocket 246 being carried by an output shaft 248 of a reduction gear box 250 driven by a motor 252 which is equipped with a conventional electric brake for positively controlling operation of the elevator of the invention.

The upper surface 206 of the platform 208 of the elevator 210 is provided with article supporting rollers 254 rotatably on horizontal axes and disposed substantially parallel with the rollers 54 and at substantially right angles to the horizontal rotating axis of the block turning mechanism, shown in FIG. 5, in which the horizontal axis is concentric with the bearing rings 110 and 112. Thus, the rollers 254 forming the upper surface 206 of the platform 208 are disposed to receive concrete blocks thereon, as shown in FIG. 3 of the drawings, or may support a pallet 204 thereon, as shown best in FIG. 9 of the drawings.

The peripheries of the rollers 254 at the upper surface 206 of the platform 208 are disposed on a substantially common plane with the upper peripheries of rollers 256 of a stationary cube receiving conveyor 258, shown in FIG. 3 of the drawings, when the platform 208 is in its lowermost position, as will be hereinafter described. Thus, as shown in FIG. 3 of the drawings, the platform 208 may be disposed at a level in which the upper surfaces of the rollers 254 are in a common plane with the upper surfaces of the rollers 256.

Adjacent to the platform area 208, but normally straddled by the plates 212 and 214 which support the platform 208 is a pusher bar 260. This pusher bar 260 is, thus, located between the plates 214 and 212 when the elevator is in its lowermost position and the pusher 260 is located between the plates 212 and 214 and a rearmost roller 262 of the rollers 254. In this manner, the platform 208 is able to move past the pusher 260 and downwardly into a position, as hereinbefore described, which is normally below the pusher 260 so that it may push a cube of blocks off from the rollers 254 on the platform 208 and onto the rollers 256 on the platform 258.

Coupled to the pusher bar 260 is a plunger 264 of a pressure fluid cylinder 266 which is supported by a bracket 268 in connection with the main frame and also, this cylinder is supported by a pivot pin 270 stationarily connected to the main frame.

Also, connected to the pusher 260 is a control rod 272 which extends through a stationary tube 274. This rod 272 when extended relative to the tube 274 passes a slot 276 in the side wall of the tube 274 and permits a roller 278 of a limit switch to move inwardly through the slot 276. Likewise, another roller 280 of a limit switch is operable when the end 282 of the rod 272 is extended from the open end 284 of the tube 274, as will be hereinafter described in detail. Thus, the control rod 272 and the rollers 278 and 280 operate limit switches at the extended and retracted positions of the pusher 260 and respective extended and retracted positions of the plunger 264 of the pressure fluid cylinder 266. Accordingly, as shown in FIG. 3 of the drawings, extension of the plunger 264 may carry the pusher 266 to a broken line position, as shown in FIG. 3 of the drawings, which is adjacent to the conveyor 258 for removing a cube of blocks from the platform 208 and placing said cube on the conveyor 258, as hereinbefore described.

While in some instances blocks C, as shown in FIG. 3 of the drawings, may not require a pallet thereunder, as hereinbefore described, some blocks which may be cubed by the machine of the invention do not have cored openings therein and consequently require a pallet thereunder so that forks of a conventional lift truck may handle such cubes which do not have the cored openings of the blocks, as shown in FIG. 3. Accordingly, a pallet magazine 286, as shown in FIGS. 1 and 10 of the drawings, is provided for use in storing pallets for delivery to a position onto the rollers 254 of the carriage 208 following each delivery of a cube of blocks on a pallet and onto the conveyor 258. The magazine 286 is a generally rectangular structure having an open top 288 into which conventional wooden pallets are positioned. These pallets are constructed generally, as shown in FIG. 9 of the drawings, they are conventional pallets having superimposed spaced horizontal wooden members secured to side members, such as 2" x 4"s allowing forks of a conventional fork lift truck to be positioned between the superimposed wooden members in order to readily locate the truck under the cube of blocks as it is supported or rested on the ground or on a platform of a truck or other surface.

Such pallets are stacked in a vertical stack in superimposed relationship to each other in the magazine 286 and pallet pickup levers 290 and 292 are pivotally mounted on respective bearings 294 and 296 fixed to respective uprights 298 and 300 of the machine frame. These levers 290 and 292 are pivotally coupled to each other by a link 302, shown in FIG. 1 of the drawings, and a plunger 304 of a pressure fluid cylinder 306 is coupled to the lever 290 so that both levers 290 and 292 are operable in unison with each other by the pressure fluid cylinder 306. An opposite end of the pressure fluid cylinder 306 from its plunger 304 is pivotally anchored to the frame of the invention in the conventional manner.

The levers 290 and 292 are provided with downwardly extending pickup ends 308 and 310, respectively, which are adapted to be pivoted inwardly and upwardly to engage the pallets 202 in the magazine 286 and to thereby raise the entire stack of pallets above a lowermost one at a level designated 312 in FIG. 10 of the drawings.

It will be seen that when the pressure fluid cylinder 308 is operated to actuate its plunger 304 in a direction as indicated by an arrow 314 that the ends 308 and 310 of the levers 290 and 292 move inwardly and upwardly, thereby engaging the pallet above the level 312 to raise all of the pallets superimposed thereabove and to free the single pallet therebelow. At this time, a pressure fluid

cylinder 316 may be energized to move the pallet below the level 312, as will be hereinafter described.

The cylinder 316 is mounted pivotally in connection with the frame of the invention by means of a pin 318 and a plunger 320 of the pressure fluid cylinder 316 is connected by means of a pin 322 to a carriage 324 which is provided with roller trucks 326 and 328 operable in tracks 330 and 332 beneath the level of the pallet lowermost in the stack and below the level 312.

A pallet engaging dog 334 is pivotally mounted to the truck 324 by means of the pin 336 and this dog 334 is provided with an inclined surface 338 which readily pivots and slides under the stack of pallets when the truck is moving in a direction of an arrow 340, shown in FIG. 10 of the drawings, so that each time the truck moves backward under the stack of pallets, it automatically slides under the lowermost pallet and the dog 334 at its inclined portion 338 pivots under the stack and then as it passes the stack, the dog pivots upwardly into a position, as shown in FIG. 10, wherein a buttress face portion 342 of the dog engages a side of the lowermost pallet so that when the truck 324 is moved in the direction of an arrow 344 that it will retract the lowermost pallet below the level 312 while ends 308 and 310 of the levers 290 and 292 hold the remaining pallets in the magazine upwardly to reduce or alleviate friction between the pallets as the lowermost pallet is moved in the direction of the arrow 344 and slid upon the rollers 254 of the platform 208 of the elevator 210. This operation of loading an unladen pallet onto the platform 208 is accomplished only when the platform 208 is in its lowermost position wherein the peripheries of the rollers 254 are substantially on a plane with the rollers 256 of the conveyor 258 and in such position the pallet may be moved onto the rollers 254 slidably and longitudinally of their axes so that the pallet assumes the position as shown in FIG. 9 of the drawings.

It will be noted that the pallet in the magazine 286, in all instances, below the level 312 follows another pallet 202 which is engaged by a second dog similar to dog 334, and which is disposed between the magazine 286 and the platform 208 so that one of the pallets being removed from the magazine 286 follows another like pallet which has already been removed from the magazine 286. From a disclosure of the FIGS. 1, 2 and 10, it will be seen that the distance from the magazine 286 to the area of the platform 208 is such that a pallet being transferred from an area at the bottom of the magazine 286 must follow another pallet 202 in horizontal alignment, as shown in FIG. 10 of the drawings, onto the elevator, the last mentioned pallet previously removed from the magazine below the level 312, as hereinbefore described.

It will be seen from FIG. 3 of the drawings, that there are a pair of levers 290 and a pair of the levers 292, the levers 290 and 292 are connected together by a pair of cross shafts designated generally at 346 in FIG. 3 of the drawings. Thus, a pair of the levers 290 and a pair of the levers 292 at the ends 308 and 310, hereinbefore described, pick up all four corners of the pallet immediately above the level 312, as shown in FIG. 10 of the drawings, and, thus, permit the pallet below the level 312 to push the pallet just previously removed onto the rollers 254 of the platform 208, as hereinbefore described.

In a modification of the present invention, as shown in FIGS. 11 and 12 of the drawings, the platform 208 is provided with the rollers 254, as hereinbefore described, and a lower portion of the platform 208 is provided with a circular row of bearing rollers 348 disposed about a central pivot axle 350 mounted on a stationary platform 352 carried by the plates 212 and 214, hereinbefore described. A trunnion bearing 354 connected to the platform 208 projects through an arcuate slot 356 in the platform 352 and connected to the trunnion 354 is a plunger 358 of a pressure fluid cylinder 360 pivotally mounted by means of a pin 362 on a lower portion of the platform plate

352. Actuation of the cylinder 360 to extend and retract the plunger 358 causes rotation of the platform 208 relative to the plates 212 and 214 and the platform plate 352. Thus, the platform 208 may be rotated upon a vertical axis generally designated at 364 in order to permit substantially ninety degrees rotation of the platform 208 following each successive layer of blocks deposited on the platform 208 so that blocks having a greater length than width may be cross linked in stacked relationship to each other to provide frictional interlocking of the blocks and thereby provide stability of the stack to prevent them from separating during transit. Thus, the modification of the invention, as shown in FIGS. 11 and 12, may provide the additional facility of rotating the elevator platform 208 substantially ninety degrees about a vertical axis to cross link blocks or articles which have a greater length than width and, thus, provide a rectangular stack or cube of such blocks or articles which tends to hold together and greatly facilitates handling of the cube to the extent that the cube does not have to be handled so carefully, but the cross linking of the blocks may be taken advantage of to alleviate the necessity for delicate handling of the cubes of blocks after they have been delivered on the conveyor 258, as shown in FIG. 3 of the drawings.

A further modification of the invention, as shown in FIGS. 13, 14, 15 and 16 of the drawings, provides for an alternate mechanical arrangement of the structure, shown in FIG. 5 of the drawings, which is utilized for turning blocks substantially ninety degrees from a position as received by the conveyor 52 to a position in which the blocks must be cubed, as shown in FIG. 3 of the drawings, on the elevator platform 208.

With reference to FIG. 13, it will be seen that the conveyor 52 delivers blocks or other articles onto the rollers 54 of a roller conveyor 52 similar to that hereinbefore described. As shown in FIG. 14, a vertically movable gate plate 366 may be projected upwardly and downwardly between the rollers 54 of the roller conveyor 52 by means of a pressure fluid cylinder 368 having a plunger 370 connected to the gate for alternately forcing an upward edge 372 upwardly and downwardly to an elevation above the rollers 54 to intercept the blocks A as they move onto the roller conveyor 54. Operation of the gate 366 will be hereinafter described in detail.

At the end of the roller conveyor 54 is a pivoted stop plate 374 which operates a limit switch in a similar manner to the structure hereinbefore described and the detail operation of which will be hereinafter described.

Directly laterally of the roller conveyor 52, as shown in FIG. 13, is a turnover plate 376 operable on a horizontal axis at right angles to the axes of the rollers 54 of the roller platform 52. The plate 376 is disposed between the roller platform 52 and a receiving edge 161 of the sliding deck plate 160, hereinbefore described.

Referring now to FIG. 15, it will be seen that the turnover plate 376 is provided with gusset plates 378 at opposite ends thereof which are sufficiently spaced to pass opposite edges 380 and 382 of the sliding deck plate 160, as will be hereinafter described.

Rotatably mounted on each plate 378 by means of an axle 384 is a roller bearing 386 which operates between vertically spaced track rails 388 and 390, thus, providing a rectilinear guide for movement of the plate 376 in a direction of an arrow 392, as will be hereinafter described.

Also, connected to each plate and rotatably mounted thereon by means of an axle 394 is a roller 396. This roller 396 at its periphery is disposed to bear and roll upon an upper surface 398 of the track member 388 when the plate 376 is pivoted upward into a broken line position 400 which is in a substantially vertical position, as compared to the horizontal position, shown by solid lines in FIG. 5.

Carried stationarily on the track portions 398 are bearing supports 402 which support each opposite end of a rubber roller 404 rotatably mounted on an axle 406 carried by said plates 402. The roller 404 is disposed adjacent a receiving edge 161 of the sliding deck plate 160, shown in FIG. 13 of the drawings.

An arm 408 is connected to each opposite end of the plate 376 and pivotally connected therewith by means of a pin 410 is a plunger 412 of a fluid pressure cylinder 414 having a pivot mounting pin 416 connected to an upright 418 of the main frame of the machine.

In operation, the cylinder 414 may be energized with pressure fluid to retract the plunger 412 from the position shown in FIG. 15, whereby the plate 376 is pivoted upwardly about the axes of the rollers 384. A block carried on the plate 376 is also rotated and is turned substantially ninety degrees about a horizontal axis by upward tilting of the plate 376 about the axis of the rollers 386 until the blocks slide into contact with the rubber roller 404 whereupon continued upward tilting of the plate 376 causes disposition thereof into a substantially vertical position whereupon the blocks engaged on the roller 404 are pivoted to a position about a horizontal axis which position is rotated ninety degrees from that of the block as received on the plate 376.

It will be seen that the cylinder 414 is mounted on an inclined angle with respect to the plate 376 and that it tends to lift the plate at the same time pivoting it about the axes of the rollers 386. Accordingly, when the plate 376 has reached a substantially vertical position, continued retraction of the plunger 412 moves the plate to a broken line position 400 whereupon the blocks are tilted and rotatably moved on the rollers 404 and onto the receiving edge 161 of the slide plate 160. At this time the peripheries of the rollers 396 bear on the track portion 398 and the rollers 386, although in the direction of the arrow 392, so that the plate 376 after being pivoted into vertical position is moved toward and over the receiving edge 116 of the slide plate 162, the broken line position 400 which places the blocks completely on the receiving end of the slide plate 160. From the foregoing it will be seen that the slide plate 376 receives blocks directly from the ends of the roller platform rollers 54 and that the modification of the invention, shown in FIGS. 13, 14, 15 and 16, is simplified with respect to that previously disclosed, thereby eliminating one pusher operation, namely, that hereinbefore described in connection with the pusher 88. The function of the turn plate 376 being equivalent to that of the mechanism hereinbefore described in connection with FIG. 5 of the drawings, namely, of rotating the blocks substantially ninety degrees about a horizontal axis after being removed from the roller conveyor 52 and previous to placement of the blocks on the sliding deck plate 160 preliminary to the dropping of the blocks therefrom and onto the platform 208 of the elevator 210, whereby the core openings in the blocks are oriented from the vertical position to a horizontal position so that a lowermost layer of blocks in a stack or cube formed on the platform 208 will be in position to receive forks of a conventional fork lift truck readily to handle a cube of blocks without the necessity of placing them on a pallet.

With respect to operation of the machine, reference is made to the diagrammatic views of the electrical equipment, as shown in FIGS. 17 and 18, and also, the pressure fluid equipment of the invention, as disclosed diagrammatically in FIG. 19, together with the mechanical disclosure of such cylinders and limit switches, as shown in diagrammatic views 17 and 18.

When concrete blocks are delivered by the conveyor 52 to the roller platform 50, they may be delivered in groups as controlled by the conveyor 52 and such is conventional since groups of blocks, when stripped from pallets generally arrive on the conveyor 52 and are delivered in the direction of the arrow B, shown in FIG. 2

of the drawings, in such groups, as for example, a group of blocks may be three blocks long and two or three blocks wide. Accordingly, the conveyor 52 is controlled to deliver these blocks onto the roller platform 50 which, when loaded, employs limit switches coupled to the conveyor control to stop operation thereof, when the roller platform 50 is limited. Such conveyor controls form no part of the present invention.

The roller platform may be of a length laterally of the axes of the rollers 54 which length is equal to a length of three concrete blocks and the platform 64 may be of comparable length to receive three blocks ahead of the pusher plate 88 when the pusher plate 72 loads the platform 64 in alignment with the pusher plate 88.

When blocks are received on the roller platform 50, they proceed to the end thereof and contact a pivot plate 424 which actuates a limit switch 425. This limit switch 425 is shown diagrammatically in FIG. 17 of the drawings, and is coupled with a time delay 430 in series with a control relay 420. Another limit switch 426 is disposed under one of the rollers 54 and particularly designated 427 in FIG. 6. This roller 427 is one nearest the end of the conveyor 52 and when blocks fill the area of the roller conveyor from the limit switch 425 to the area of the limit switch 426, both limit switches 425 and 426 energize the time delay 430 and the control relay 420 which thereby energizes a solenoid valve 445 disposed to introduce pressure fluid to the cylinder 79 for actuating the pusher plate 72 in a direction toward the platform 64 for forcing a row of blocks onto the platform 64 in alignment with the pusher plate 88. It will be seen that the control relay 420 is coupled to the limit switch 425 and the time delay 430 by means of a conductor 435 and that the solenoid valve 445 can be energized only when the limit switch 470 is engaged by retraction of the pusher 88 in connection with the plunger 90 of the pressure fluid cylinder 92 controlled by the solenoid valve 450. Thus, the pusher plate 72 can be actuated toward the platform 64 only when the pusher plate 88 is retracted out of the way of blocks entering the platform 64.

It will be seen that the normally open contact of the control relay 420 coupled to conductor 440, where a signal to the solenoid valve 445 to actuate the pressure cylinders 79 and pusher 72 toward the platform 64 when the plunger 90 of the actuating cylinder 92 is retracted.

When pusher plate 72 forces blocks onto the platform 64, the blocks contact a pivoted plate 65 which actuates a limit switch 460 coupled to a conductor 465, thereby energizing a relay 466 coupled to a conductor 467 in connection with the solenoid valve 445 and, thus, the plunger of the cylinder 79 is extended to force the pusher plate 72 against blocks to load them on the platform 64, each time the platform 64 is empty and the plunger 90 is retracted to actuate the limit switch 470, shown in FIG. 3 of the drawings.

The plunger of the cylinder 79 and the pusher plate 72 is retracted away from the platform 64 when control relay 420 is de-energized through conductor 475 by limit switch 426.

It will be noted that the pusher plate 72, when it forces blocks onto the platform 64 and to actuate the limit switch 460 by the plate 65, that the solenoid valve 445 is actuated to immediately retract the plunger of the cylinder 79 and the pusher 72 slightly to relieve pressure from the blocks on the platform 64 so that they may be moved by the pusher 88 at right angles thereto in a subsequent operation, as will be hereinafter described. Thus, the pusher plate 72 is activated backward slightly each time it goes forward toward the platform 64 to relieve pressure on the blocks to later be actuated by the pusher plate 88.

As the pusher plate 88 is actuated toward the plate 128, the switch 470 activates a time delay 493 which actuates the solenoid valve 445, as hereinbefore described, to cause momentary retraction of the pusher plate 72. As

the time delay 493 times out, the valve 445 is again actuated to cause actuation of the pusher plate 72 in a direction to force blocks onto the platform 64 ahead of the pusher plate 88.

When the platform 64 is filled forward of the pusher plate 88, the solenoid valve 450 is energized through a conductor 485 through control relay 486 energized by operation of limit switch 480 as the plunger 78 is momentarily retracted after the platform 64 is filled with blocks ahead of the pusher 88. Thus, the normally open contacts of relay 486 are closed to thereby energize the pressure fluid cylinder 92 through the conductor 485 and the solenoid valve 450. It will be seen that the solenoid valve 450 is energized in one direction in connection with the conductor 485 and is spring loaded in the other direction.

As the pusher 88 is activated toward the block turning mechanism of the invention, limit switch 490 is actuated which causes control relay 492 to be de-energized.

The solenoid valve 450 and pressure fluid cylinder 92 will not be energized in the event the block turning mechanism of the invention, illustrated in FIG. 5, is ready to receive a load of blocks thereinto. For example, control relay 494 must be de-energized through conductor 496 which will de-energize control relay 494 when limit switch 498 is held open by a full load of blocks exerting pressure against a pivoted plate 499 at the end of the block turning mechanism, shown in FIG. 5 of the drawings. Further, the pusher plate 88 will not be actuated toward the turnover mechanism to load it until the plate 158 is in position clear of the plate 142, as shown in FIG. 8 of the drawings, so that the limit switch 502 must be engaged by the plunger bar 130 connected to the plunger 132 of the cylinder 134. Accordingly, it will be understood that the control relay 492 controlling operation of the pusher plate 88 will not be energized unless the turning mechanism, shown in FIG. 5, is in position to turn with respect to limit switch 504, shown in FIG. 5 of the drawings. Thus, the block turning mechanism of the invention must be in the position, as shown in FIG. 9 of the drawings, and ready to rotate in a direction of an arrow 506 and, thus, the limit switch 504 must be engaged to maintain operation of the control relay 492 and therefore energization of the solenoid valve 450 for actuating the plunger 90 of the cylinder 92 which pushes the pusher plate 88.

Inasmuch as rotation of the block turning mechanism, as shown in FIG. 5, is optional, the blocks may either be turned from a position, as shown in FIG. 9, to a position, as shown in FIG. 5, or the turning mechanism may remain in the position, as shown in FIG. 5, for each cycle after the first layer of blocks has been laid on the platform 208, as shown in FIG. 3. Accordingly, a turn bypass switch 507 provides optional use of limit switch 504 or a limit switch 508 for maintaining energization of the control relay 492 to permit the pusher 88 to operate for filling the block turning mechanism, as shown in FIG. 5. When the mechanism is in position, as shown in FIG. 5, the switch 508, thus, maintains energization of the control relay 492 and the block turning mechanism may be loaded in the position, as shown in FIGS. 5 and 8, for loading blocks directly from the platform 64 and onto the plate 142 when it is not desired to turn the blocks ninety degrees, as hereinbefore described.

Thus, the first layer of blocks may be placed on the platform 208 in the position, as shown in FIG. 3, by rotating them ninety degrees from their position as received on the conveyor 52 and then all subsequent layers of blocks may be transferred from the platform 64 onto the plate 142 in the position, as shown in FIGS. 5 and 8 of the drawings, so that subsequent layers may be laid in the same relative position as received from the conveyor 52.

Thus, the switch 507 provides for optional turning of the blocks on a horizontal axis by means of the block

turning mechanism, shown in FIG. 5. It will be seen that when the switch 507 is not utilized and the limit switch 504 is controlling, that when the limit switch 508 is contacted by rotation of the block turning mechanism to a position, as shown in FIG. 5, control relay 492 is de-energized consequently causing de-energizing of the solenoid valve 450 and consequently retraction of its plunger 90 and the pusher 88.

When the block turning mechanism has been rotated to the position, as shown in FIGS. 5 and 8 of the drawings, or when it has been maintained in this position by optional use of the switch 507, the solenoid valve 500 is activated to energize the pressure fluid cylinder 134 and to retract its plunger 132 for moving the plate 158 over the plate 142 and for forcing blocks onto the sliding deck 160. Thus, the solenoid valve 500 is actuated in a position to retract the plunger 132 of the cylinder 134 by the normally open contacts of the control relay 494 when energized. The control relay 494 when de-energized causes extension of the plunger 132 and movement of the plate 158 in the opposite direction of the arrow F, as shown in FIG. 8, to the solid line position, as disclosed therein.

The control relay 494 will only be activated to cause movement of the pusher plate 158 toward the sliding deck 160 when the following conditions are in existence: First of all, the plate 142 may be loaded full of blocks in such a manner that the limit switch 498 is closed. Reference being made to this switch in connection with conductor 510, in FIG. 17 of the drawings. Additionally, the control relay 494 will not be energized until the sliding deck 160 is in position, as shown in FIG. 8 and also in FIG. 1, to receive blocks from the plate 142. Accordingly, limit switch 512 must be closed in connection with electrical conductor 514 in series with limit switch 508 in connection with conductor 516 coupled to control relay 494. Thus, the block turning mechanism 96 must be the position, as shown in FIG. 8 of the drawings, before the control relay 494 can be energized to actuate the plunger 132 of the cylinder 134 to move blocks onto the plate 160. Additionally, limit switch 498 must be closed, all switches 498, 512 and 508 must be closed, therefore in order to actuate the cylinder plunger 132 in a direction of the arrow F, in FIG. 8 of the drawings.

It will be seen from FIGS. 1 and 3 of the drawings, that several rows of blocks may be delivered from the plate 142 onto the sliding deck 160, thereby requiring several successive operations of the pusher plates 72 and 88 and the plate 158 to fill the upper surface of the sliding deck 160 whereupon a plate 518 is pivotally actuated by the blocks as they fill the desired area on the slide plate 160 and pivotal movement of the plate 518 actuates a limit switch 520, as will be hereinafter described in detail.

It will be understood that the block turning mechanism 96 may be actuated when no blocks are on the plates 158 or 142 and may be deactivated through control relay 494 or energized therethrough in accordance with operation of the limit switch 498 and selector switches 522 and 524 coupled to a control relay 526.

If no blocks are to be turned by the block turning mechanism 96, both switches 522 and 524 are turned to open position and if only a first layer of blocks, as shown in FIG. 3, are to be turned, the switch 524 may be closed and control relay energized whereupon this control relay 526 is de-energized when the sliding plate 160 is filled and to an extent which causes actuation of the limit switch 520, as hereinbefore described. When this happens, the control relay 526 will be de-energized and accordingly, the block turning mechanism 96 will discontinue its operation for the remaining layers of blocks to be placed over the first layer rotated ninety degrees about a horizontal axis and deposit it on the platform 208, as shown in FIG. 3.

If all layers of blocks are to be turned ninety degrees before placement on the platform 208, the switch 522 is

closed to maintain energization of the control relay 526 and to maintain automatic turning operation of the block turning mechanism 96 with each cycle of operation, hereinbefore described, in connection with the actuation of the pusher plates 72 and 88.

When the sliding plate 160 is filled and the limit switch 520 is actuated and limit switch 528 carried by the elevator 208 engages one of the vertical position stops 30 on a vertical pole 532 of the machine control relay 534 is held activated and held open, thereby energizing solenoid valve 536 to deliver pressure fluid to the cylinders 186 and 188 to retract their respective plungers and to slide the sliding deck plate 160 outwardly from beneath the blocks which are restrained from movement by the bar 198, shown in FIGS. 1 and 9 of the drawings.

Control relay 534 also maintains the solenoid valve 500 energized in order to hold the plate 158 against the blocks as the sliding deck plate 160 is retracted to prevent the blocks from tipping while the slide plate is being moved, thus, the blocks are held clamped between the plate 158 and the bar 198, hereinbefore described.

As the sliding deck plate 160 is retracted, limit switch 540 is activated, thereby de-energizing control relay 494.

When limit switch 520 is activated and when a limit switch 529 carried by the elevator 208 is in contact with one of the spaced stops 530 on a vertical pole 532 of the machine, control relay 534 is activated and held open by the elevator interlock circuitry which initially causes the sliding deck plate 160 to be retracted and to drop blocks on the elevator.

When the blocks drop on the elevator, they may cause actuation of the limit switch similar to the limit switch 520, they may break a sonic barrier or light beam, causing a time delay 560 to be energized in connection with conductor 29. The time delay 560 being activated by a switch 562 which may either be said limit switch or it may be a photosensitive switch or a sonically responsive switch and this switch 562 may be any suitable switch responsive to downward movement of the blocks after they have been dropped from the sliding deck plate 160.

Thus, the time delay 560 energizes the elevator motor 252 to move the elevator downwardly, thereby bypassing the limit switch 529 for a sufficient amount of time and during a short duration until limit switch 529 contacts the next lower tab 530 on the pole 532. These tabs 530 are spaced equal to the distance between the tiers of blocks to be placed on the elevator to form cubes of blocks, as hereinbefore described. Each successive layer of blocks placed upon the elevator in superimposed relationship is accomplished, as hereinbefore described, and when the elevator has moved downward successively with each cycle involved in the placement of a layer of blocks on the elevator and when the cube of blocks is completed, the elevator moves down beyond the last and lowermost tab 530 at which time the elevator contacts a limit switch 544, thereby energizing control relay 546. The normally open contacts of the control relay are thereby closed to energize a solenoid valve 550 disposed to conduct pressure fluid to the cylinder 266 for extending its plunger 264 to thereby push the cube ejector pusher 260 in a direction toward the conveyor 258 for pushing a cube of blocks from the rollers 254 on the elevator platform 208 and outward onto the rollers 256 of the receiving roller conveyor 258, as shown in FIGS. 3, 17 and 18 of the drawings.

When the control bar 272 in connection with the pusher 260 becomes fully extended, it passes the slot 276 in the tube 274 and permits limit switch 565 to be actuated, thereby de-energizing control relay 546 and causing de-energization of the solenoid 550 to a relay 570 thereby reversing the operation of the solenoid valve 550 and causing retraction of the plunger 264 of the cylinder 266 and consequently retraction of the pusher bar 260 and the rod 272. Complete retraction of the rod 272 actuates

the limit switch 575, the operation of which will be hereinafter described.

If it is desirable to utilize pallets on the elevator platform 208, a pallet selector switch 580 is manually closed to energize a control relay 582. This control relay 582 is energized by operation of the limit switch 565 and, also, the limit switch 575 to insure retraction of the pusher bar 260 from its position over the elevator to permit a pallet to be forced thereonto by operation of the pressure fluid cylinder 316. This pressure fluid cylinder 316 is energized through a solenoid 590 in connection with a relay 592 coupled to a conductor 594, shown in FIG. 20 of the drawings.

From FIG. 10 it will be seen that in order to push a pallet toward the elevator platform 208 that the pressure fluid cylinder 316 must be energized to retract its plunger 320, as hereinbefore described.

It will be understood that the operation of control relay 582, also, is energized through conductors 594 to energize the solenoid valve 590 to conduct pressure fluid to the cylinder 306 which concurrently actuates the pallet lifting mechanism in the magazine 286, as hereinbefore described, so that the pallets are relieved from the lowermost pallet below the level 312, shown in FIG. 10, to facilitate sliding the lowermost pallet by power applied to the dog 338 by the actuation of the pressure fluid cylinder 136.

As the pallet pushing carriage 330 moves toward the elevator platform 208 and places a pallet thereon, a pallet pusher limit switch 600, shown in FIG. 2 of the drawings, is engaged by the truck frame 330 which thereby de-energizes control relay 582.

Previously during energization of control relay 546, limit switch 602 was closed when the elevator moved downwardly and this switch 602 being closed, maintained control relay 604 closed, where-upon de-energization of control relays 546 and 582, the opening of limit switch 575 energizes time delay 598 which in turn energizes a relay switch 606 to thereby energize the elevator operating motor 252 in a direction to move the elevator platform 208 upwardly until limit switch 602 is again engaged and opened, at which time the rollers 254 at their upper peripheries are on a substantially common level with the plate 142 of the block turning device 96 and the upper surface of the sliding deck plate 160, as shown in FIG. 8 of the drawings. Engagement of the switch 602, thus, de-energizes the relay 604 and its contacts 606 to thereby stop operation of the motor 252 when the elevator reaches its uppermost position so that the switch 529 is in position to proceed downwardly to the first switch actuating tab 530 on the member 532 following the placement of the first layer of blocks on the elevator by retraction of the sliding deck plate 160, as hereinbefore described.

In accordance with operation of the structure, shown in FIGS. 11 and 12 of the drawings, for rotating the platform 208 ninety degrees during the placement of each alternate layer of blocks on the platform, it will be seen that a limit switch 610 disclosed in FIG. 4 of the drawings, is provided with a contact arm 612 which is engageable with tabs 614 connected to the upright 532, hereinbefore described, which upright also carries the tabs 530, hereinbefore described. These tabs 530 being spaced equal to the vertically disposed tiers of blocks to be placed on the platform 208 in a cubical assembly. The tabs 614 are spaced apart twice as far as the tabs 630 and consequently, are disposed to actuate the switch 612, each alternate time, one of the tabs 530 is engaged by the switch 529, as hereinbefore described. Thus, the turn table rotating mechanisms, disclosed in FIGS. 11 and 12, may be controlled to rotate the turn table ninety degrees for each alternate tier of blocks placed on the platform 208.

With reference to FIGS. 4, 11, 12 and 20, it will be seen that the switch 610 is coupled to a relay 616 disposed to energize a solenoid 618 which operates a solenoid valve

to conduct pressure fluid into and out of the actuator cylinder 360, disclosed in FIGS. 11 and 12 of the drawings. Accordingly, the solenoid valve 618 is maintained in one position during contact of the switch arm 612 with any one of the tabs 614 and when the platform is controlled by the intermediate tabs 530 disposed between the tabs 614, the platform is, thus, maintained in a position ninety degrees from that when the arm 612 of the switch 610 contacts one of the tabs 614. Thus, the double acting function of the cylinder 360 as controlled by the solenoid valve 618 automatically rotates the turn table 208 ninety degrees in order to cause cross linking of the superimposed tiers of blocks placed thereon to form a rectangular or cubical stack of blocks, as hereinbefore described.

It will be seen that the solenoid valve 618 is energized through a conductor 620 and that the valve is spring loaded in the opposite direction so that the plunger 358 of the cylinder 360 may be actuated in one direction when the valve is energized and actuated in the opposite direction when the valve is de-energized.

In the modifications of the invention, as disclosed in FIGS. 22 to 34, improvements in the block rotating mechanism are disclosed and also improvements in the means for depositing a layer of blocks on top of an uppermost layer of blocks of a cube being formed by the machine, are disclosed.

Concrete blocks are carried to the cubing machine of the invention on a conveyor 650 which moves blocks in a direction of an arrow 652, shown in FIGS. 23 and 24 of the drawings. The conveyor 650 delivers blocks onto a second conveyor 654 which serves as an accumulating and control conveyor. Mounted on a side plate 656 are switch actuating levers 658, 660 and 662 which operate respective switches 664, 666 and 668. These levers 658, 660 and 662 are engageable by concrete blocks moving on the conveyor 654 and travel of the concrete blocks is such, that the combined width of three blocks in this particular instance, between a side plate 670 and the levers 658, 660 and 662 will cause engagement of the levers as the blocks pass in a direction of the arrow 652 on the conveyor 654.

The switches 664, 666 and 668 when actuated, serve as control means for starting and stopping the conveyors 652 and 654 so that blocks may be intermittently and constantly fed to a short platform 672 over which the blocks are pushed onto a secondary loading platform 674 from which they are slidably moved in a direction of an arrow 676 by sweep bars 678 carried by chains 680 and 682, said sweep bars 678 being movable over the upper surface of the loading platform 674 which may be a substantially flat plate, as will be hereinafter described.

A stop plate 684 adjacent to the platform 674 acts as a stop for blocks pushed onto the platform 674 and the plate 684 is pivoted or movable in a manner to cause operation of a switch 686 when the platform 674 is loaded, as shown in FIG. 23 of the drawings.

The chains 680 and 682 are each supported on and driven by a pair of sprockets 688 and 690 on respective shafts 692 and 694 which are intermittently driven in accordance with operation of the switch 686 and other control factors, as will be hereinafter described.

As shown in FIG. 25, each of the chains 680 and 682 is connected to the bars 678 which sweep across the platform 674 in a direction of the arrow 676. A pivoted platform 696 is mounted on arms 698 which are pivoted to the lower side of the platform 674 by pins 700. The arms 698 are pivotally connected by pins 702 to an arm 704 engaging a coil spring 706 mounted in a housing 708 and pivoted to the lower surface of the platform 674 by a pin 710. Thus, the platform 696 is resiliently mounted and is permitted to pivot downwardly when one of the bars 678 passes beyond the end 712 of the platform 674 and moves downwardly on an arc concentric with the respective sprockets 690. Thus, the endless chains 684 carry the bars 678 across the platform 674 intermittently in a direction of the arrow 676 to move blocks off from

the platform 674 in the direction of the arrow 676, all as will be hereinafter described in detail.

As shown in FIG. 22, the shaft 694 and consequently both of the chains 680 and 682 are driven by a chain 714 on a sprocket 716 connected to the shaft 694, the chain 714 being driven by a sprocket 718 on the output shaft of a reduction gear motor 720.

Disposed on a common level with the platform 674 and the pivoted platform 696 is a tilting platform 722. This platform 722 may be tilted from a horizontal position on a common plane with the platform 674 to a substantially vertical position for carrying concrete blocks and turning them from a position in which their core openings are disposed vertically to a position in which their core openings are disposed horizontally.

Connected to each opposite end of the tilting platform 722 is a bracket 724 on which are mounted a pair of rollers 726 and 728 adapted to roll in a channel structure 730 carried on a bearing 740 pivoted on a shaft 742 carried at each end thereof by a bracket 744 mounted stationarily on an element 746 of the machine frame.

Projecting from the bracket 724, as shown in FIGS. 26, 27 and 30, is a trunnion 748 to which is pivotally connected a link 750. The link 750 is pivotally connected at its opposite end by a pin 752 to a lever 754 fixed to a shaft 756 driven by a pulley 758 and belt 760 engaged by another pulley 762 and powered by a reduction gear motor 764. The shaft 756 is, thus, adapted to rotate intermittently by operation of the reduction gear motor 764, said shaft being controlled to rotate substantially 360° so that during the first 90° the pivot pin 752 will be accelerated and during the last 90° of the 360° rotation, the pin 752 will be decelerated for controlling pivotal action of the tilting platform 722, as will be hereinafter described in detail.

Pivotally mounted on the channel arm 730 by means of a pin 766 is an actuating cylinder 768 having an extendable and retractable plunger 770 which is pivotally connected to a bell crank arm 772 by means of a pin 774. The bell crank arm 772 is fixed to an end 776 of the shaft 742.

Also fixed to the shaft 742, shown best in FIGS. 29, 31, 33 and 34, are fingers 778. These fingers 778 at their root portions 780 are fixed by welding or otherwise to the shaft 742 and the upper surfaces of these fingers 780 and the upper surface of the shaft 742 is disposed substantially on a common plane with the upper surface of the tilting platform 722 and the previously described platforms 674 and 696.

It will be seen that retraction of the plunger 770 into the cylinder 768 will cause pivotal movement of the bell crank 772 and the shaft 742 relative to the channel arm 730 so that the fingers 778 may be pivoted from a horizontal position to a substantially vertical position while the link 750 may hold the platform 722 in stationary horizontal position, as will be hereinafter described.

As shown in FIGS. 29 and 30, the fingers 778 are spaced apart longitudinally of the shaft 742 and feather edge fingers 782 of a depositing plate 784 are disposed between the fingers 778. Feather edge end portions 786 of the fingers 782 are disposed in slightly spaced relation from the shaft 742 between the fingers 778, all as will be hereinafter described in detail.

The fingers 782 are carried by the plate 784 which is pivotally mounted on a carriage 788 by means of trunnions 790, all as shown best in FIGS. 30, 31, 32, 33 and 34.

The carriage 788 having the trunnions 790 mounted thereon is disposed to receive a layer of blocks ultimately to form an upper layer of blocks of a cube being formed by the machine of the invention and the carriage 788 is arranged to support the fingers 782 on a plane substantially flush with that of the plate 674 and the tilting platform 722 and the shaft 780.

Referring to FIG. 35 of the drawings, it will be seen that the carriage 788 is a substantially channel shaped in cross section carriage having a bottom plate 792 provided with an upper surface 794 on which blocks are carried, as shown in FIGS. 33 and 35, preliminary to the depositing of such blocks on the upper portion of a cube being formed, as shown in FIGS. 33 and 34. This carriage 788 is provided with substantially vertical side walls 796 and 798 which suspend the plate 794.

Upper edge portions of the side walls 796 and 798 are provided with oppositely directed horizontal flanges 800 and 802 which bear on and are supported by rollers 804 and 806, respectively. These rollers 804 and 806 are arranged in rows and there are a plurality of each connected in a horizontal row to respective stationary frame elements 808 and 810 of the machine of the invention. Thus, the carriage 788 is arranged to roll or slide horizontally on the frame and this carriage is provided with upstanding chain connectors 812 and 814 extending upwardly from the flanges 800 and 802, respectively. Chains 816 and 818 are connected respectively to the upstanding structures 812 and 814, these chains 816 and 818 are endless chains engaging drive sprockets 820 and 822, respectively, on a motor driven shaft 824, the shaft being mounted in bearings 826 and 828 supported on the frame members 808 and 810. The shaft 824 is fitted with a sprocket 830 engaged by a chain 832 and driven by another sprocket 834 on the output shaft of a motor 836, shown in FIG. 22 of the drawings. The chains 816 and 818 are endless chains and also extend over sprockets 838 on a shaft 840 spaced from the shaft 824. Thus, the motor 836 is capable of driving the carriage backwardly and forwardly relative to the frame and to carry the fingers 782 into a position, as shown in FIG. 30, intermediate the fingers 778 and also to carry the fingers 782 backwardly away from the fingers 778 to deposit a layer of blocks on a cube being formed, as indicated in FIGS. 33 and 34 of the drawings.

Connected to the side walls 796 and 798 of the carriage 788 are brackets 842 and 844, respectively, which carry rollers 846 and 848, respectively. These rollers bear on outer sides of the machine frame members 808 and 810, respectively, to maintain lateral alignment of the carriage 788 between the frame members and relative to the fingers 778 so that the fingers 782 may be disposed therebetween alternately, as hereinbefore described.

Connected to the plate 784 with which the fingers 782 are integral, are cam operated arms 850 and 852. These arms, as well as the fingers 782, swing about the pivotal axes of the trunnion 790 which extend outwardly from the side walls 796 and 798 of the carriage 788.

Upper cam edge portions 854 and 856 of the cam arms 850 and 852, respectively, engage stationarily mounted rollers 858 and 860, respectively, which are carried on brackets 862 and 864, respectively. These brackets are stationarily mounted on the machine frame members 808 and 810. The rollers 858 and 860 are, thus, disposed to be traversed by the arms 850 and 852 as the carriage 788 is moved back and forth by operation of the motor 836, as hereinbefore described. The upper cam engaging surfaces 854 and 856 are contoured, as shown in FIGS. 31, 32, 33 and 34, to permit the feather edge ends 786 of the fingers 782 to be pivoted downwardly in close proximity to an upper surface 866 of a cube of blocks being formed so that the next successive layer of blocks 868 carried on the plate 794 of the carriage 788 and all of the fingers 782 may be lowered into very close proximity with said upper surface 866 to prevent dropping of the blocks 868 from the edge of the plate or bottom 794 of the carriage 788 when the blocks are removed therefrom, as will be hereinafter described in detail. The aforementioned removal of the blocks from the carriage bottom plate 794 is accomplished by means of axially stationary and axially horizontal rubber rollers 870 and 871 are held and rotatably mounted on the frame members 808 and

810 by means of axles 872 and 873 which interconnect these frame members. The rollers 870 and 871 are, thus, disposed between the walls 796 and 798 of the carriage 788 and when the carriage is retracted is relieved of the blocks simply by the expedient of sliding the carriage away from the blocks as they are abutted and held by the axially stationary rollers 870 and 871. During this operation, however, the cam arms 850 and 852 engaging the respectively stationary rollers 858 and 860 are permitted to pivot downwardly so that the feather edge portions 786 of the fingers 782 unload the blocks 868 in extremely close proximity to the upper surface 866 of the previously laid block layer of a cube of blocks being formed by the machine, as indicated in FIG. 33 of the drawings.

It will be noted that the pointed ends 786 of the fingers 782 are substantially wedge shaped and are so arranged that the point 786 may almost coincide with the upper surface 866 of the cube of blocks being formed. The wedge shaped feather edge points 786 being operable about the axes of the trunnion 790 in cooperation with the respective vertical positioning of a cube supporting elevator 874, as shown in FIG. 22 of the drawings. This elevator 874 is provided with means for motorizing it upwardly and downwardly in substantially the same manner as the elevator hereinbefore described and shown in FIG. 4 of the drawings, which employs a motor 250 and driven chain 238. Any suitable means for moving the elevator 874 upwardly and downwardly may be used to position the upper surface 866, as shown in FIG. 33, in accordance with limit switches so that the upper layer of blocks will be properly disposed with respect to the downward pivotal movement of the feather edge portion 786 of the fingers 782 as provided by the control cam surfaces 856 in engagement with the cam rollers 860, hereinbefore described and shown in FIG. 33 of the drawings.

It will be seen that the cam surfaces 854 and 856 are provided with rise portions 876 which, when they engage the rollers 860 during forward movement of the carriage toward the fingers 778, that the cam portions 876 will cause the arms 852 to pivot the fingers 782 upwardly into a common plane with the fingers 778 for receiving blocks onto the carriage 788, as will be hereinafter described in detail.

The operation of the modified structure of the invention, as shown in FIGS. 22 to 35, is substantially as follows:

As hereinbefore described, concrete blocks are delivered to the modified structure of the machine, as shown in FIGS. 22, 23 and 24 by means of an endless belt conveyor 650, the blocks being delivered to the machine in the direction of the arrow 652, shown in FIG. 23. As the blocks proceed from the conveyor 650 onto the conveyor 654, the limit switches 664, 666 and 668 are operated in series, as hereinbefore described, in order to control motorized operation of the conveyor 650 and the conveyor 654 and to deliver blocks to the plate or platform 672 previous to their loading onto the platform 674 which is filled when the blocks engage the plate 684 to operate the limit switch 686, as hereinbefore described. Thus, energization of the motor 720 to drive the chains 680 and 682 is accomplished. These chains carry the bars 678 to force the blocks across the platform 674 and as the bars 678 reach the plate 696, as shown in FIG. 25, the bars downwardly pivoting the plate 696 out of interference with these bars. During this operation, the blocks are moved onto the tilting platform 722 and when the cycle controlling switch of the machine is set to turn only certain layers of blocks, the tilting platform 722 may not be actuated and the blocks may move directly across the tilting platform 722, thence, across the shaft 742 and fingers 778 which are intermeshed by the fingers 782 so that the blocks may be pushed completely onto the lower plate 794 of the carriage 788 when it is in a

position, as shown in FIG. 31 of the drawings. The filling of the platform 788 may be limited by operation of a limit switch which may be engaged by the blocks as they proceed to a position in contact with the axially stationary rollers 870 and 871, hereinbefore described. When this occurs, the carriage 788 may be retracted by means of the operation of the motor 836 and the chains 816 and 818, as hereinbefore described, when the carriage 788 is retracted, the cam arms 852 are permitted to pivot downwardly into the position, as shown in FIG. 33, and their engagement with the rollers 860 to permit the feather edge portion 786 of the fingers 782 to move into close proximity with the upper surface of the cube of blocks being formed by the machine so that the blocks 868 are not dropped appreciably and, thus, chipping of the blocks is avoided during the depositing of a layer of blocks on the cube being formed.

It will be seen that when the fingers 782 are retracted to the position, as shown in FIG. 34, a layer of blocks is completely laid on the cube being formed and the elevator 784 may then move downwardly to a position in which another layer of blocks may be laid on the cube.

This elevator may move downward a sufficient distance to clear the return movement of the carriage 788 and then move upwardly into a position comparable to that shown in FIG. 33 at which the upper surface 866 is disposed to receive another layer of blocks to form the cube.

When the carriage 788 is again returned to the position, as shown in FIG. 31 of the drawings, another layer of blocks may be pushed onto the bottom plate 792 of the carriage 788, as hereinbefore described.

When it is desired to rotate a layer of blocks to be placed in the carriage 788 so that the normally vertically disposed core openings are disposed in a horizontal disposition to receive forks of lift trucks, the cycling control switch of the machine is arranged to actuate the tilting platform 722, as follows:

With reference to FIG. 31, it will be seen that the fingers 778 may be retracted into a substantially vertical position and into a position extending upwardly from the shaft 742 and that the tilting platform 722 is almost exactly the dimension to coincide with the width of blocks, as shown in FIG. 31. Thus, when the fingers 778 are raised into vertical position extending upwardly from the shaft 742, they act to restrain movement of the blocks in a direction of the arrow 676, as shown in FIG. 3, and to accumulate a row of blocks on the tilting platform 722, said row being, thus, collected in order that they may subsequently be rotated substantially 90°, as will be hereinafter described.

The fingers 778 and shaft 742 are rotated by energization of the fluid power cylinder 768 to retract its plunger 770 and to move the fingers 778 upwardly in a direction of an arrow 771, shown in FIG. 31 of the drawings. The power cylinder 768 may, thus, hold the fingers in a vertical position while the link 750 holds the tilting platform 722 in horizontal position.

When a row of blocks has been forced onto the tilting platform 722, it may be tilted upwardly in a direction of an arrow 723, shown in FIG. 32 of the drawings, by actuation of the link 750 powered by the motor 764 and the bell crank arms 754, as hereinbefore described. When the link 750, thus, moves the tilting platform 722 the rollers 726 in the channel shaped track 730 exert force thereon about the axis of the shaft 742 and, thus, the tilting platform is pivoted in connection with the channel track 730 about the bearings 740.

The channel track 730 is, thus, pivoted from a vertical position, as shown by broken lines in FIG. 32, to a horizontal position as shown by solid lines in FIG. 32.

When the tilting platform 722 is pivoted from the horizontal position to the vertical position, the fingers 778 are concurrently tilted from the vertical position to the horizontal position while the cylinder 730 is still energized to hold its plunger 770 in retracted position and to hold

the fingers 778 in stationary relation to the shaft 742. Thus, the shaft 742 together with the arm 772 is rotated at the same time that the channel bracket 730 is rotated.

When the rotating mechanism is rotated into the position, as shown in FIG. 32, the blocks are then disposed in such a position that their normally vertically disposed core openings are disposed horizontally.

A complete rotation of the wheel 758 and the bell crank 754, as shown in FIG. 2 of the drawings, causes the 90° pivotal movement of the tilting plate 722 from a horizontal position to a vertical position and then, further, causes movement of the tilting platform 722 to a broken line position 725, shown in FIG. 32, in order to push the tilted blocks onto the fingers 782 and onto the finger supporting plate 784 so that each subsequent row of blocks that are turned may force the preceding row of blocks onto the plate 794 of the carriage 788.

During movement of the tilting plate 722 from its solid line position, shown in FIG. 32, to the broken line position 725, the rollers 726 roll longitudinally of the channel 730 and during a completion of the rotational cycle of the bell crank arm 754 the tilting platform 722 progresses back to the solid position, shown in FIG. 32, and thence, a reverse directional pivotal movement, as indicated by the arrow 723 back to the original broken line position 727, which corresponds with the solid position of the tilting platform 722, as shown in FIG. 31.

It will be understood that when the rotating mechanism is moved in the direction pivotally, as indicated by the arrow 723, that the fingers 778 move from a vertical position to a horizontal position and that they move downwardly between the fingers 782 to, thus, deposit the rotated blocks on the fingers 782 preliminary to the pushing of the blocks further onto the fingers by movement of the tilting platform 722 into the broken line position 725, all as indicated by the arrow 729 in FIG. 32 of the drawings.

With reference to FIG. 28, the various positions of the trunnion 748, rollers 726 and 728, link 750 and bell crank arm 754, are shown.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

We claim:

1. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit said blocks on said elevator; a depositing tapered edge means carried by said deck and disposed at an edge of said deck from which blocks are deposited from said deck and onto said elevator; and third means pivotally mounting said tapered edge means relative to said deck and on a substantially horizontal axis; deck loading means disposed at a level to load block onto said tapered edge means, said tapered edge means and said deck movable toward and away from said loading means; and operating means for holding said tapered edge means upwardly at said level, when adjacent said deck loading means, and to permit downward pivotal movement of said tapered edge means, when moved away from said deck loading means, said tapered edge means being thin and disposed substantially horizontally so that it may be pivoted downwardly into substantially contact disposition with upper surfaces of blocks carried by said elevator to minimize the vertical distance between blocks being deposited from said deck and those on said elevator.

2. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck

means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit said blocks on said elevator; a depositing tapered edge means carried by said deck and disposed at an edge of said deck from which blocks are deposited from said deck and onto said elevator; and third means pivotally mounting said tapered edge means relative to said deck and on a substantially horizontal axis; deck loading means disposed at a level to load block onto said tapered edge means, said tapered edge means and said deck movable toward and away from said loading means; and operating means for holding said tapered edge means upwardly at said level, when adjacent said deck loading means, and to permit downward pivotal movement of said tapered edge means, when moved away from said deck loading means, said tapered edge means being thin and disposed substantially horizontally so that it may be pivoted downwardly into substantially contact disposition with upper surfaces of blocks carried by said elevator to minimize the vertical distance between blocks being deposited from said deck and those on said elevator; and fourth means for moving said elevator upwardly and downwardly in vertically spaced positions approximately equal to the vertical dimensions of said blocks.

3. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit said blocks on said elevator; a receiving and depositing edge means of said deck; deck loading means disposed at a level to load blocks onto said tapered edge structure, said tapered edge structure and said deck movable toward and away from said loading means; and operating means for holding said tapered edge structure upwardly at said level, when adjacent said deck loading means, and to permit downward pivotal movement of said tapered edge structure, when moved away from said deck loading means tapered edge structure of said edge means tapered to a thin edge; said thin edge disposed horizontally; and operating means movably mounting said edge means to permit said thin edge to move downwardly into close proximity to upper surfaces of blocks on said elevator when said deck means is being retracted from beneath blocks thereon, whereby said thin edge structure is slidably removed from beneath blocks thereon at a minimum elevation above the upper surfaces of blocks on said elevator to thereby minimize the distance blocks are dropped when deposited from said deck means to said upper surfaces of blocks on said elevator.

4. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit said blocks on said elevator; a receiving and depositing edge means of said deck; deck loading means disposed at a level to load blocks onto said tapered edge structure, said tapered edge structure and said deck movable toward and away from said loading means; and operating means for holding said tapered edge structure upwardly at said level, when adjacent said deck loading means, and to permit downward pivotal movement of said tapered edge structure, when moved away from said deck loading means tapered edge structure of said edge means tapered to a thin edge; said thin edge disposed horizontally; and operating means movably mounting said edge means to permit said thin edge to move downwardly into close proximity to upper surfaces of blocks on said elevator when said deck means is being retracted from beneath blocks thereon, whereby said thin edge structure is slidably removed from beneath blocks thereon at a minimum elevation above the upper surfaces of blocks on said elevator to thereby minimize the distance blocks are dropped

when deposited from said deck means to said upper surfaces of blocks on said elevator; cam means of said operating means actuated by retracting movement of said deck means.

5. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit said blocks on said elevator; a receiving and depositing edge means of said deck; deck loading means disposed at a level to load blocks onto said tapered edge structure, said tapered edge structure and said deck movable toward and away from said loading means; and operating means for holding said tapered edge structure upwardly at said level, when adjacent said deck loading means, and to permit downward pivotal movement of said tapered edge structure, when moved away from said deck loading means tapered edge structure of said edge means tapered to a thin edge; said thin edge disposed horizontally; and operating means movably mounting said edge means to permit said thin edge to move downwardly into close proximity to upper surfaces of blocks on said elevator when said deck means is being retracted from beneath blocks thereon, whereby said thin edge structure is slidably removed from beneath blocks thereon at a minimum elevation above the upper surfaces of blocks on said elevator to thereby minimize the distance blocks are dropped when deposited from said deck means to said upper surfaces of blocks on said elevator; cam means of said operating means actuated by retracting movement of said deck means; said cam means comprising cooperating elements connected to said deck and said main frame.

6. In a means for moving and turning concrete blocks from a position in which their core openings are disposed vertically to a position in which their core openings are disposed horizontally the combination of: a shaft disposed on a substantially horizontal axis; first means fixed to said shaft and extending radially therefrom; track means pivotally mounted relative to said shaft and having track portions thereon disposed at an angle to said shaft; a tilting platform movably mounted on said track means and disposed at substantially right angles thereto; first actuating means disposed to pivot said tilting platform from a substantially horizontal position to a substantially vertical position and, further, to move said platform along said track means in a horizontal direction; and second actuating means carried by said track means and disposed to pivot said shaft and said first means substantially 90° relative to said track means; whereby said tilting platform and said first means may both be in substantially horizontal position to permit blocks to slide thereover, and whereby pivotal movement of said shaft and said first means may be accomplished by said second actuating means to dispose said first means into a substantially vertical position above said shaft while blocks having their core openings disposed vertically are deposited on said tilting platform while it is in horizontal position; said blocks in said last mentioned position being forced into contiguous relation with said first means in its vertically disposed position and whereby operation of said first actuating means pivots said tilting platform substantially 90° from a horizontal position to a vertical position and, thus, pivoting of said track means and said first means together with said shaft to a horizontal position carrying said blocks to a position wherein their core openings are disposed horizontally and whereby further actuation of said first actuating means moves said tilting platform horizontally along said track means over said first means for sliding said blocks laterally away from the axis of said shaft and off from said first means.

7. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator;

block restraining means for restraining blocks on said deck means to a position over said elevator; means for retracting said deck from below blocks thereon to thereby deposit them on said elevator; a receiving and depositing edge means of said deck; taper edge structure of said edge means tapered to a thin edge; said thin edge disposed horizontally; and tapered edge operating means movably mounting said edge means to permit said thin edge to move downwardly into close proximity to upper surfaces of blocks on said elevator when said deck means is being retracted from beneath blocks thereon, whereby said tapered edge structure is slidably removed from beneath blocks thereon at a minimum elevation above the upper surfaces of blocks on said elevator to thereby minimize the distance blocks are dropped when deposited from said deck means to said upper surfaces of blocks on said elevator; means for moving and turning concrete blocks from a position in which their core openings are disposed vertically to a position in which their core openings are disposed horizontally; said last mentioned means disposed to turn blocks and deliver them onto said tapered edge means and said deck; a shaft disposed on a substantially horizontal axis; first finger means fixed to said shaft and extending radially therefrom; track means pivotally mounted relative to said shaft and having track portions thereon disposed at an angle to said shaft; a tilting platform movably mounted on said track means and disposed at substantially right angles thereto; first actuating means disposed to pivot said tilting platform from a substantially horizontal position to a substantially vertical position and, further, to move said platform along said track means in a horizontal direction; and second actuating means carried by said track means and disposed to pivot said shaft on said first means substantially 90° relative to said track means; whereby said tilting platform and said first means may both be in substantially horizontal position to permit blocks to slide thereover; and whereby pivotal movement of said shaft and said first means by said second actuating means may dispose said first finger means into a substantially vertical position above said shaft while blocks having their core openings disposed vertically are deposited on said tilting platform when it is in horizontal position; said blocks in said last mentioned position being contiguous with said first finger means when in said vertically disposed position; and whereby operation of said first actuating means pivots said tilting platform substantially 90° from a horizontal position to a vertical position and, thus, pivoting said track means and said first finger means together with said shaft to move said first finger means to a horizontal position and carrying said blocks to a position in which their core openings are disposed horizontally and whereby further actuation of said first actuating means moves said tilting platform horizontally along said track means and over said first finger means for sliding said blocks laterally from the axis of said shaft and off from said first finger means, said first finger means comprising a plurality of fingers disposed in spaced relation to each other longitudinally along said shaft; said tapered edge means comprising a plurality of second spaced fingers terminating in said thin edge, said second spaced fingers disposed to mesh between said fingers of said first finger means when said deck is moved toward said shaft.

8. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means for retracting said deck from below blocks thereon to thereby deposit blocks on said elevator; a depositing edge means carried by said deck and permitting disposition of blocks therefrom onto a cube of blocks being formed when said deck is retracted; and third means for moving said elevator downwardly a substantial distance below said deck during each cycle of operation thereof and means for moving

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said elevator upwardly during each cycle of said deck in order to dispose an upper surface of a cube of blocks being formed at a proper level for depositing blocks from said edge of said deck as said deck is retracted over said elevator.

9. In a block stacking machine the combination of: a main frame; a vertically movable elevator thereon; a horizontally movable deck means movable over said elevator; first means for restraining blocks on said deck means to a position over said elevator; second means 10 for retracting said deck from below blocks thereon to thereby deposit blocks on said elevator; a depositing edge means carried by said deck and permitting disposition of blocks therefrom onto a cube of blocks being formed when said deck is retracted; and third means for moving 15 said elevator downwardly a substantial distance below said deck during each cycle of operation thereof and means for moving said elevator upwardly during each cycle of said deck in order to dispose an upper surface of a cube of blocks being formed at a proper level for 20

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depositing blocks from said edge of said deck as said deck is retracted over said elevator; said edge of said deck being tapered to minimize the drop distance of said blocks as they are moved from said deck onto an upper 5 layer of blocks on a cube being formed on said elevator.

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